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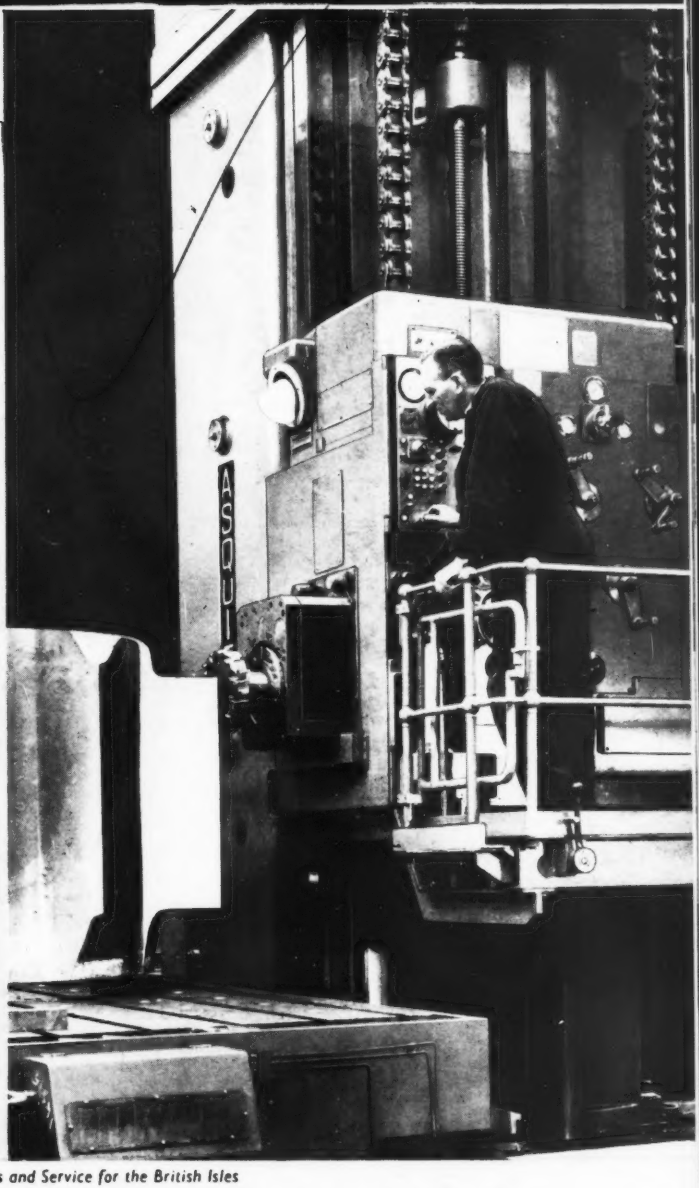

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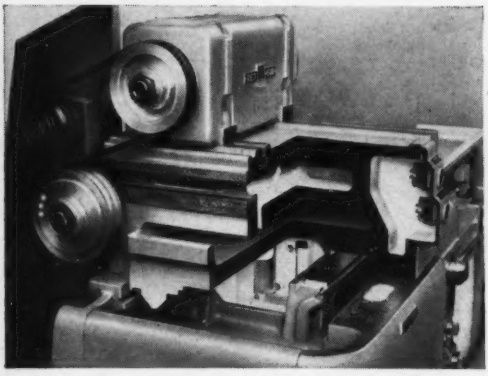

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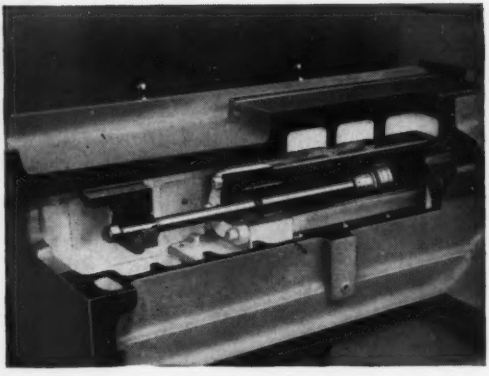

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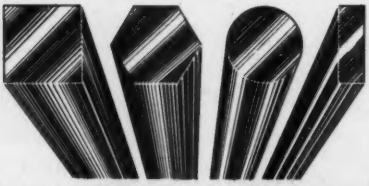

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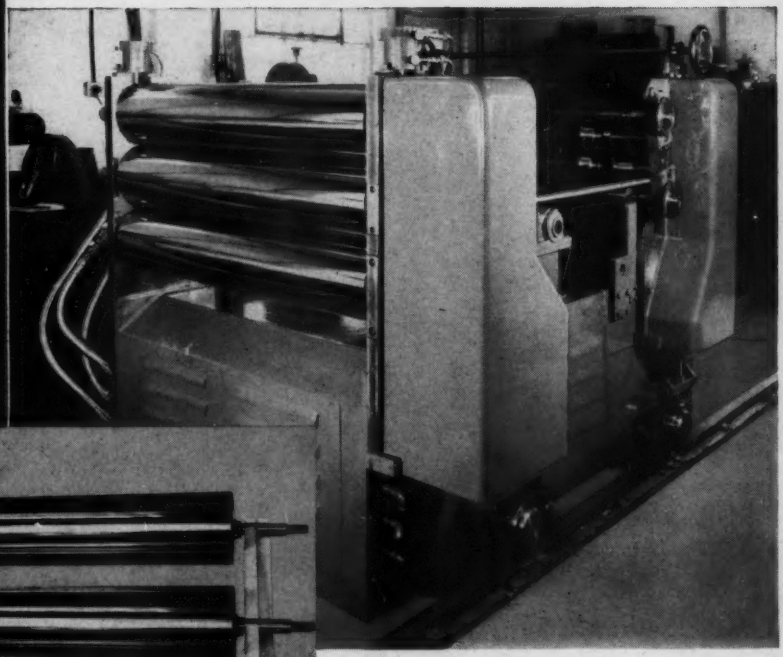

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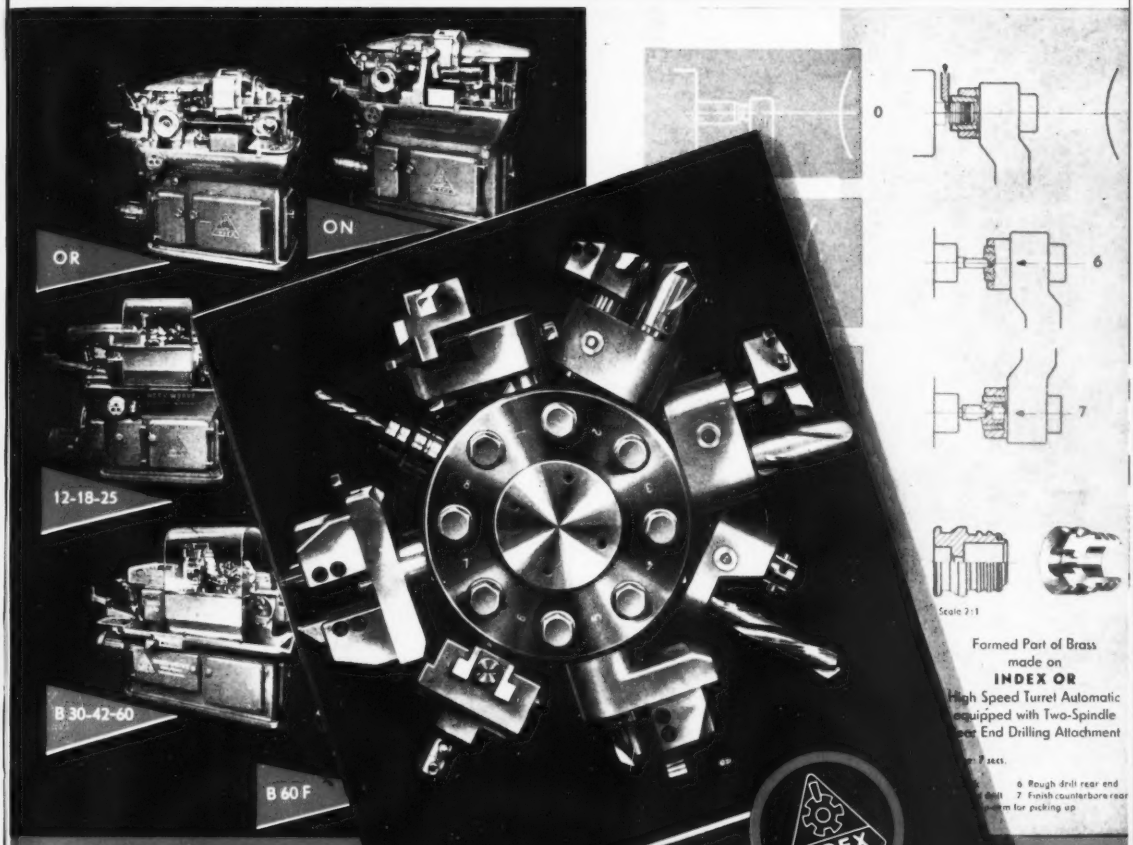

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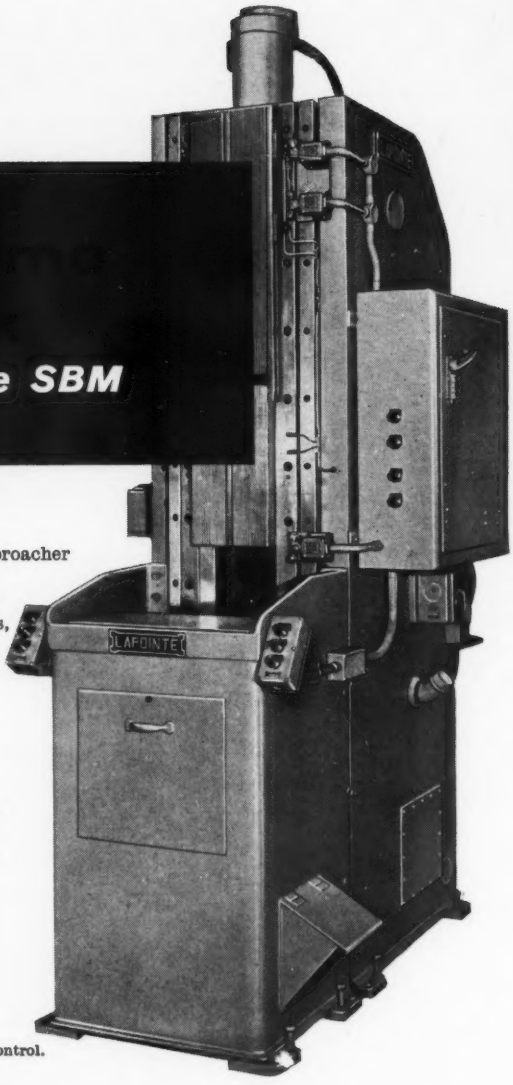

This low-cost Lapointe surface broacher shortens the gap between the end of one run and the start of another. Push button controls, automatic lubrication and other typically Lapointe features make it ideally suited for small or large batch production . . . make it the best value machine in its class. The SBM typifies the engineering skill and design that go into every Lapointe machine. Best results are obtained when equipped with Lapointe-designed fixtures and tools.

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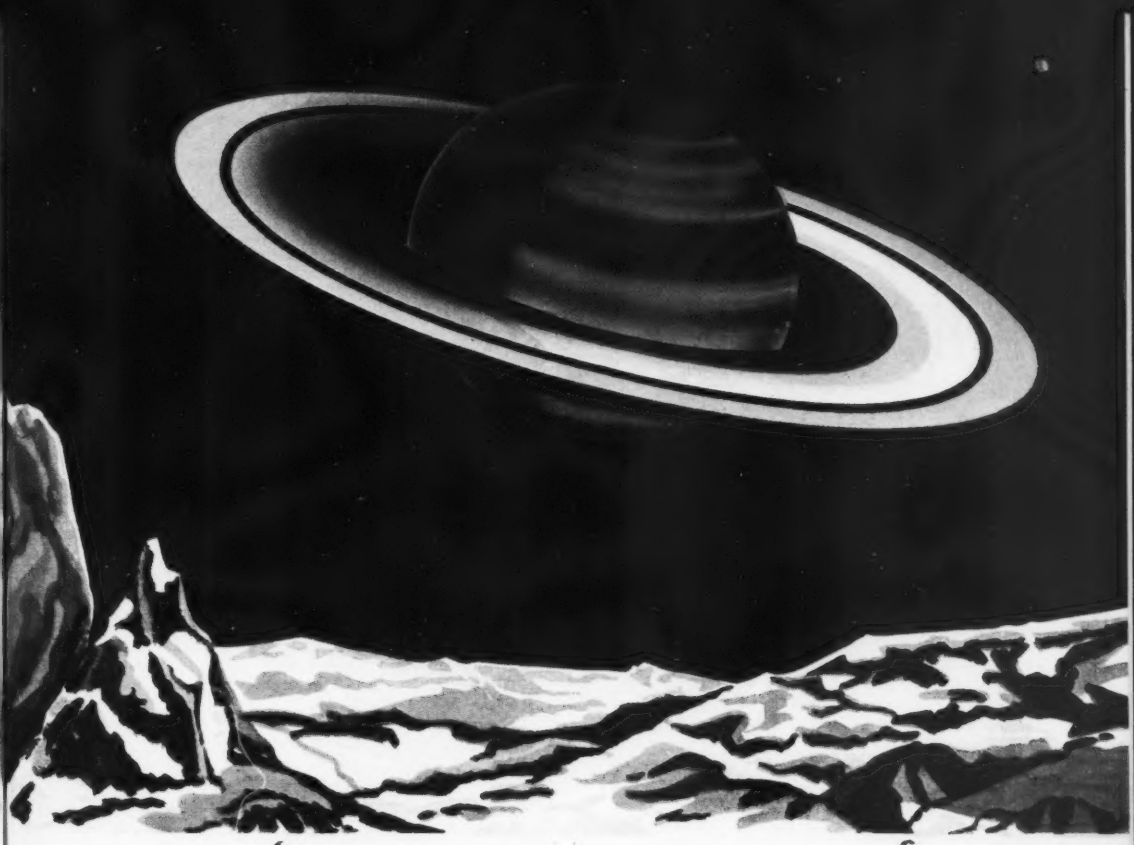

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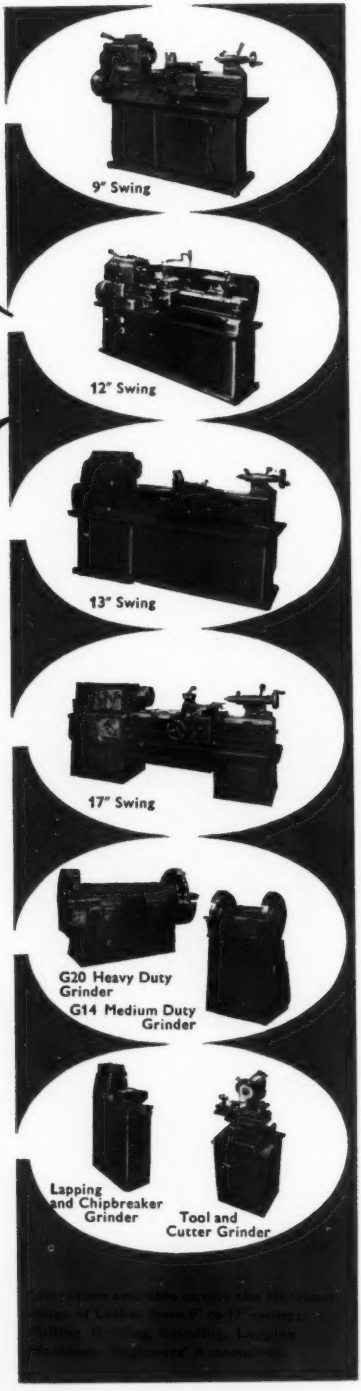

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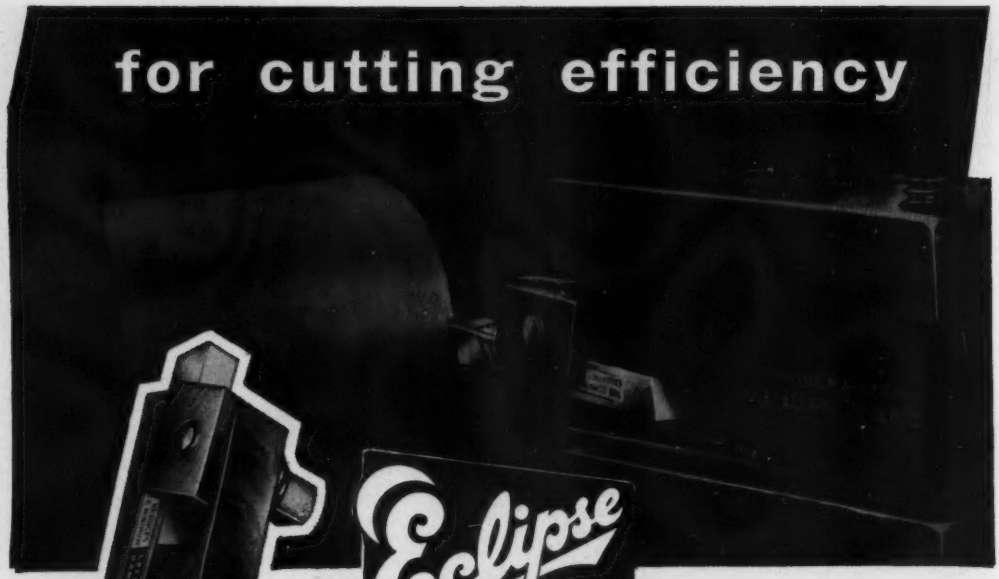

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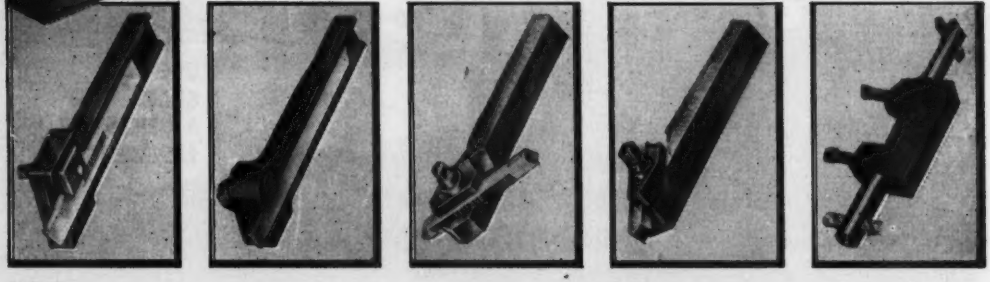

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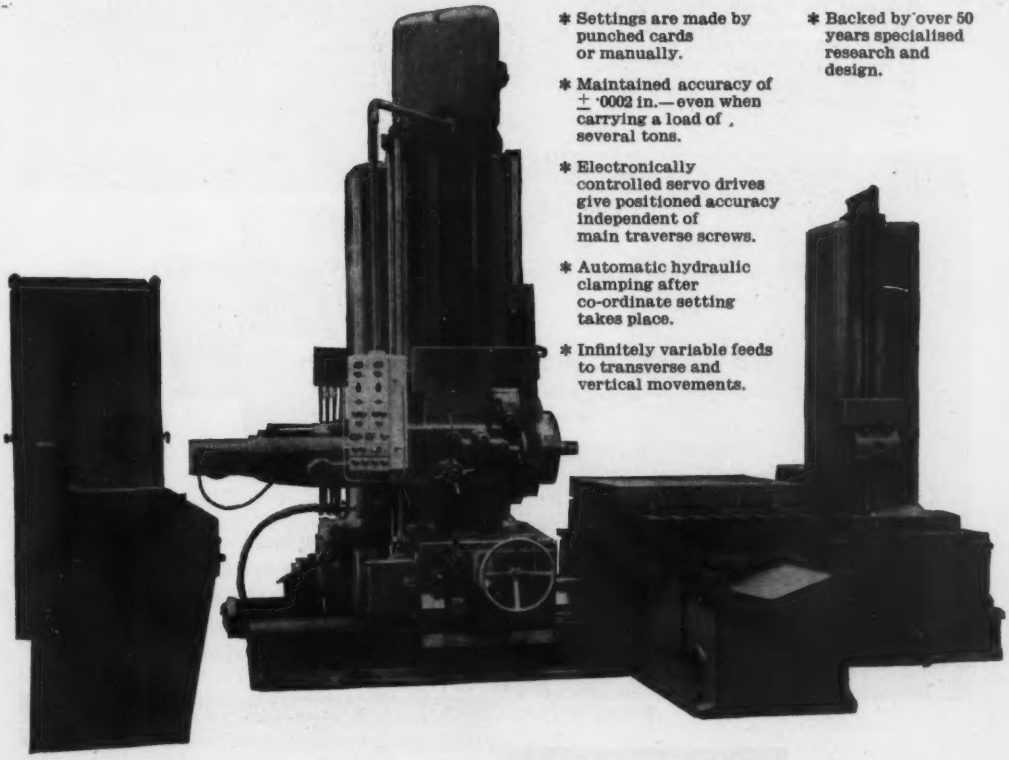

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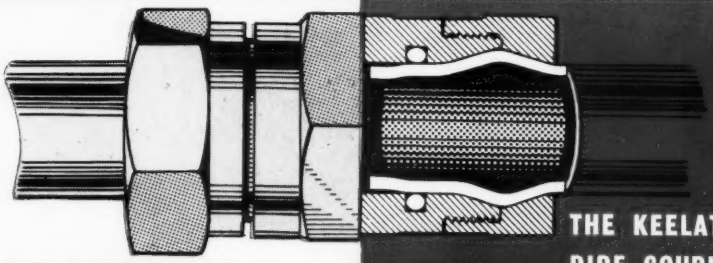

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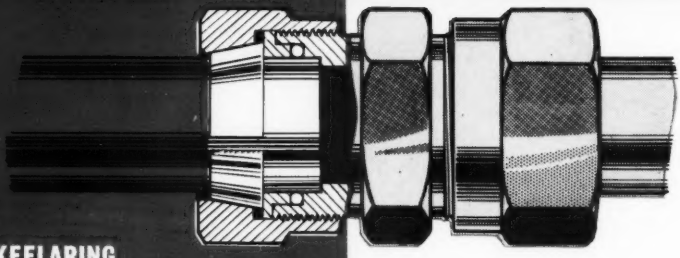

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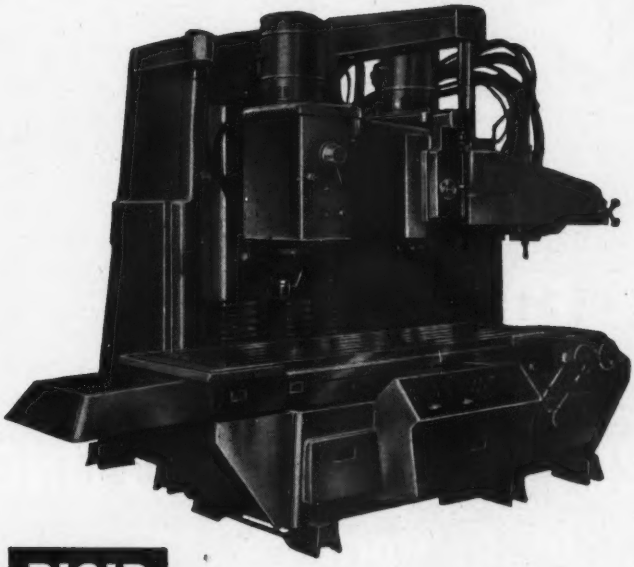

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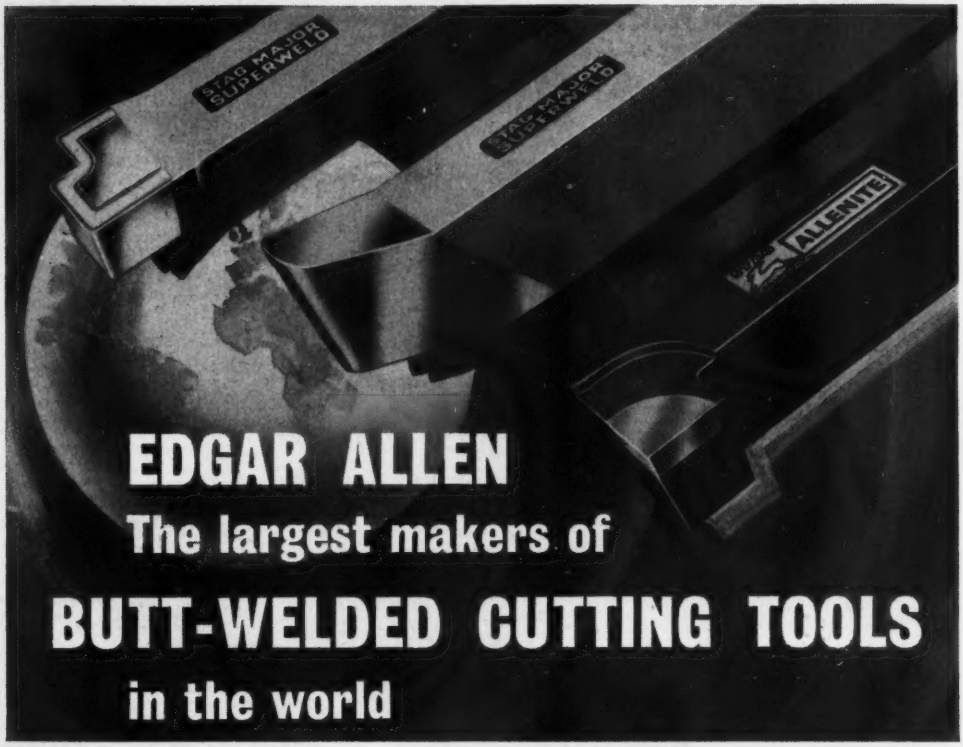

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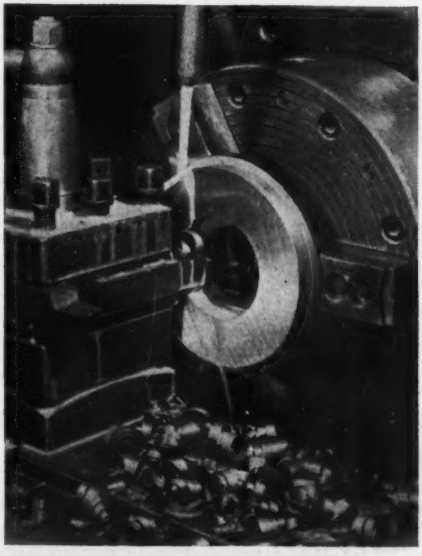

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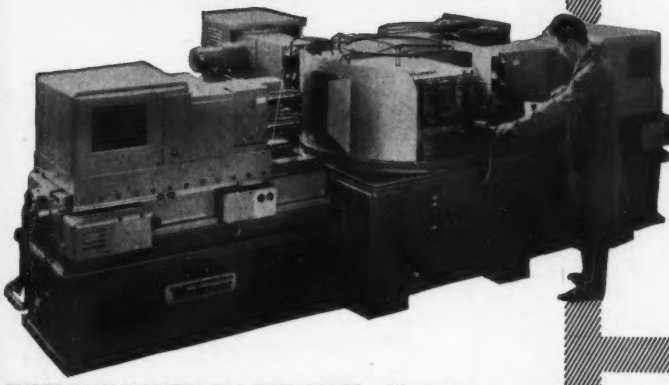

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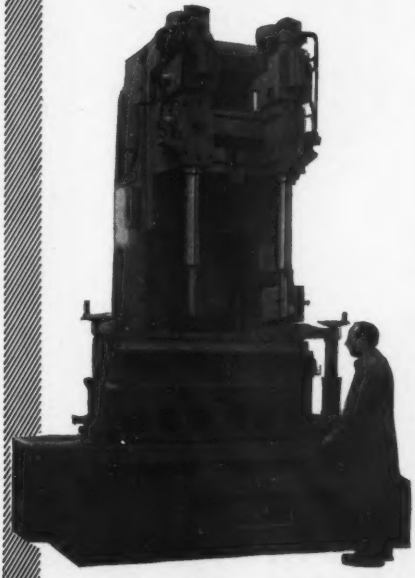

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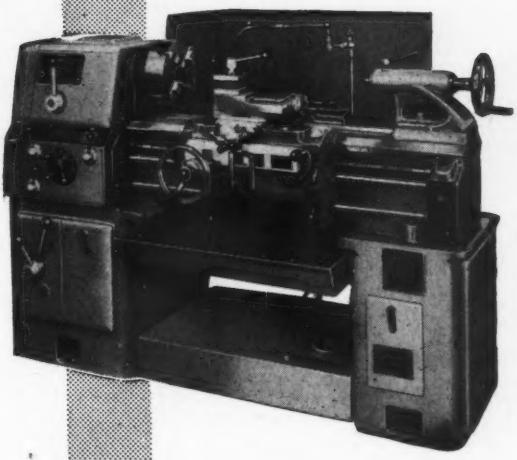

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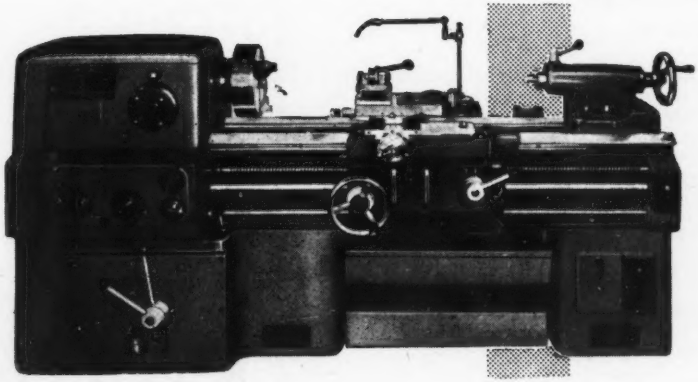

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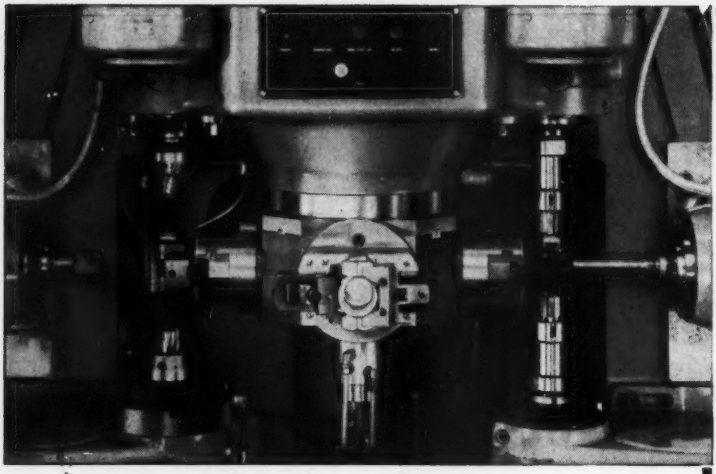

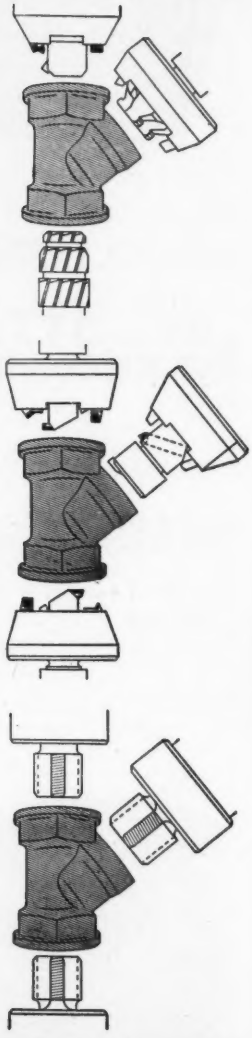

Diedesheim fully Automatic multi-unit machine

for the production of pipe fittings, valve and cock bodies

and similar components

MODEL AMI WITH 9 UNITS

MODEL AMII WITH 12 UNITS

- Suitable for drilling — boring — facing — threading — sawing — milling — multi-spindle drilling & tapping, etc.
- Simultaneous machining — from three directions — at each station.
- Capacity for ⅜″ to 2″ nominal size pipe fittings
- Spindle speeds to suit all materials
- Infinitely variable feed to each unit
- Foolproof reloading during cutting cycle
- Hydraulic chucking with auto-release
- Rapid change-over to different components
- Three or four working stations

Production times for lateral valve housing illustrated:
¼″ nom. size: 7 secs. 1″ nom. size: 10 secs. 2″ nom. size: 18 secs.

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Machine Tool Co. Ltd

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Fully Automatic Cycle *plus*

crush formed full profile wheels

The most advanced machine of its class, the fully automatic Magerle is designed both for surface grinding and high production profile work. By the Magerle method, crush formed work is now produced as easily as surface grinding. Let us send you full particulars on this versatile, high precision machine.

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PRODUCTION PROFILE GRINDER

- Constant peripheral wheel speed.
- Auto compensation for wheel wear through dressing.
- Auto-sizing within 0·0002in.
- Table sizes from 29½in. by 9 7/16in. to 49½in. by 9 7/16in.

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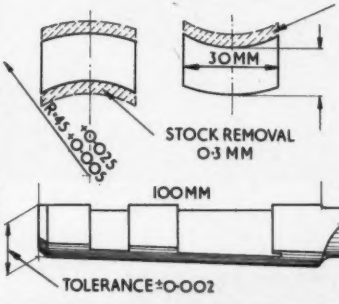

GRINDING OF ROOTS ON STEAM-TURBINE BLADES

GRINDING TIME floor to floor 1·5 minutes
ACCURACY OF FORM 0·01 mm

GASTON E. MARBAIX LTD.

NRP. 3423D

DEVONSHIRE HOUSE, VICARAGE CRESCENT, BATTERSEA, LONDON, S.W.11 **Phone: BATtersea 8888 (8 lines)**

THE wm RANGE

The range of machines produced by Woodhouse & Mitchell includes centre lathes and turret millers. Three of the latest designs are illustrated here : built to modern specifications, they are being used with complete satisfaction by discriminating engineers.

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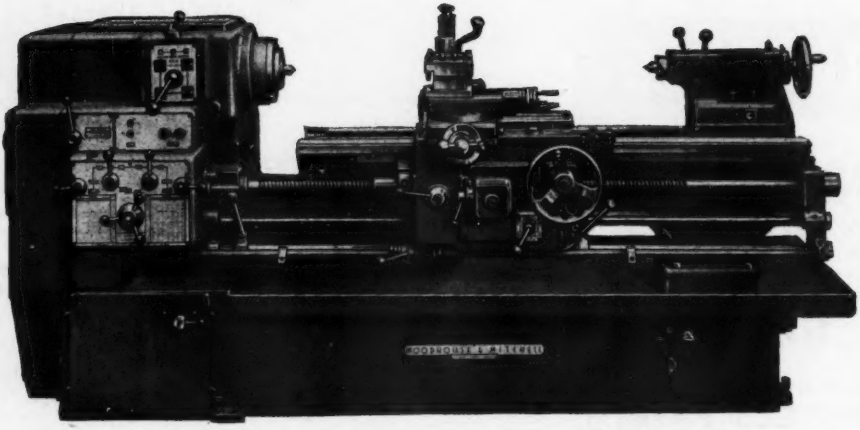


'85' 8½" and 10½" Centre Lathes

8½in. size : 10 h.p. motor, 12 speeds 21-945 r.p.m.

10½in. size : 12 speeds 14-630 r.p.m.

alternative, 21-945 r.p.m.

WOODHOUSE & MITCHELL

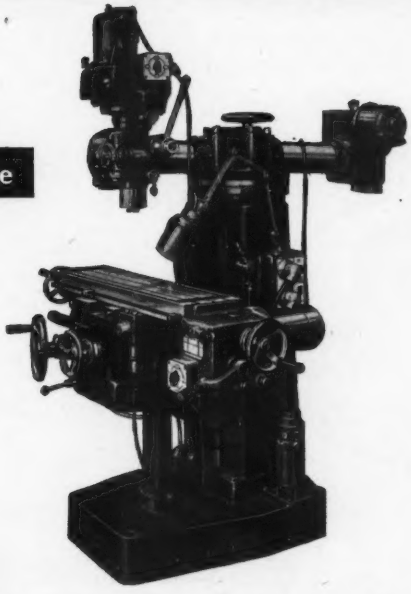
When answering advertisements kindly mention MACHINERY.

'70' Junior 7" Centre Lathe

2 h.p. motor; 8 speeds, 30-437 r.p.m. also alternative 44-640 r.p.m., and (when fitted 2-speed motor) 30-874 r.p.m. and alternatively 40-1200 r.p.m. Sizes are made to admit 45in., 54in. and 72in. between centres.

wm wm wm wm

369 Turret Milling Machine



For millling, boring and jig-boring at any angle, key-way and end milling, die-sinking, mould and pattern-making. Table 36in. by 9in., 10 spindle speeds 100-2000 r.p.m. (alternative 200-4000 r.p.m.)

WAKEFIELD ROAD · BRIGHOUSE · YORKS

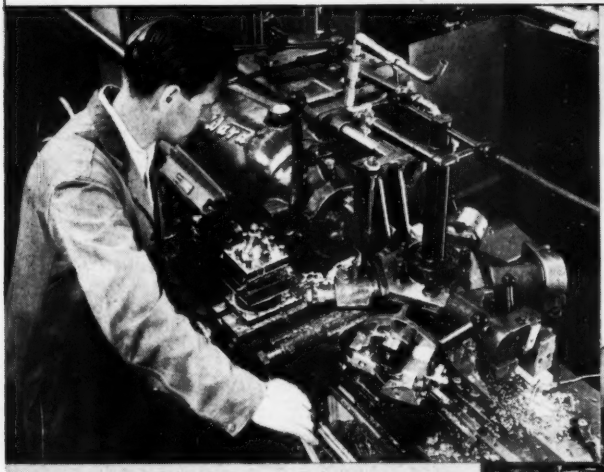
PHONE: BRIGHOUSE 627 (3 LINES) — GRAMS: 'WOODHOUSE BRIGHOUSE'

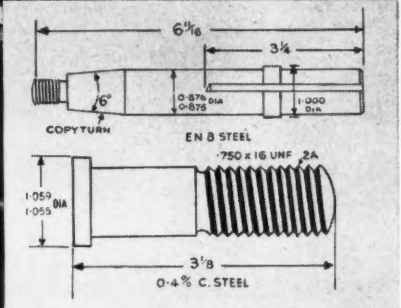
WM33

For Maximum Production

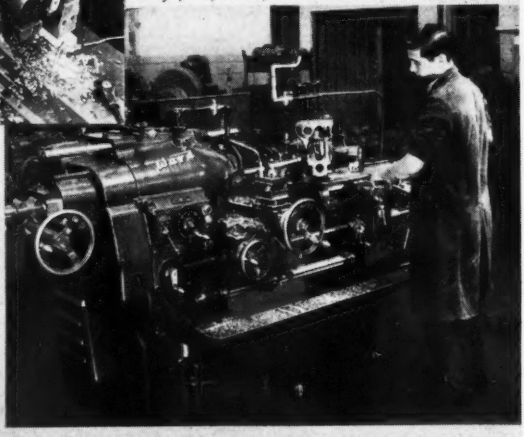
Ward 'DS'

DOUBLE-SLIDE CAPSTAN LATHES



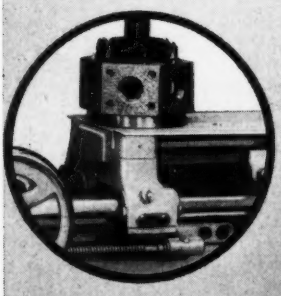


Photographs by courtesy of HOLMAN Bros. Ltd., Camborne



The New DOUBLE-SLIDE allows heavier work with higher rates of removal and provides

Greater Rigidity and Accuracy



Throughout the whole of its forward movement, the hexagonal turret is supported underneath by a sliding bridge which is in direct contact with the bed on all its working surface. This ensures correct alignment at all times, whatever weight of tools the turret carries.

SIZES AVAILABLE

	2DS	3DS	7DS
Bar Capacity with Standard Spindle	1¼ in	1½ in	2 in
with oversize Spindle	1½ in	2 in	2½ in

'PRELECTOR' No. 7 Combination Turret Lathe with Preselective speed-changing.

COMBINATION TURRET LATHES with capacities up to 35 in. swing over bed

1½ in. to 2½ in. 'D-S' DOUBLE-SLIDE Capstan Lathes for heavier accurate work.

Tools, Toolholders, Chucks and Accessories for Capstan and Turret Lathes.

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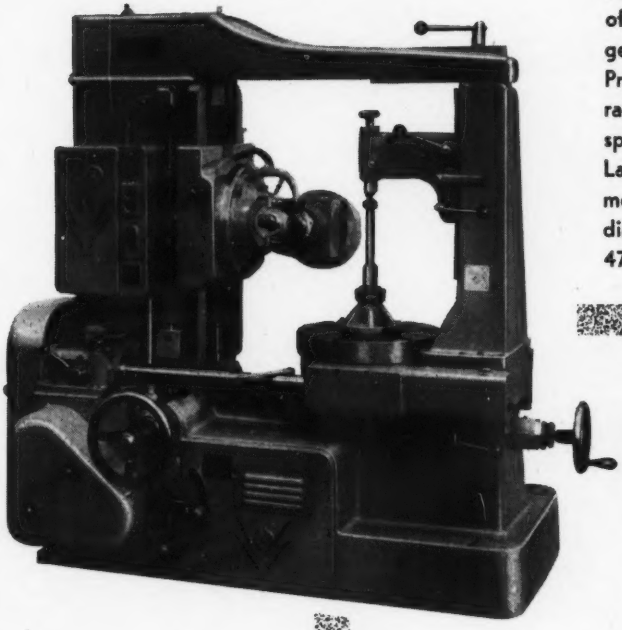

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Produces spurs, helicals, ratchet wheels, worms and splines.
Larger machine available, model KF2, maximum gear diameter that can be hobbed 47".

ÄLMHULT AUTOMATIC GEAR HOBBER KF1

✳ ECONOMIC
✳ ACCURATE
✳ VERSATILE

SPECIFICATION

Max. gear diameter that can be hobbed	23½"
Min. centre distance, cutter spindle-table	1⅛"
Vertical travel of hob head slide	17 5/16"
Table diameter	19⅛"
Table worm wheel indexing diameter ...	16"

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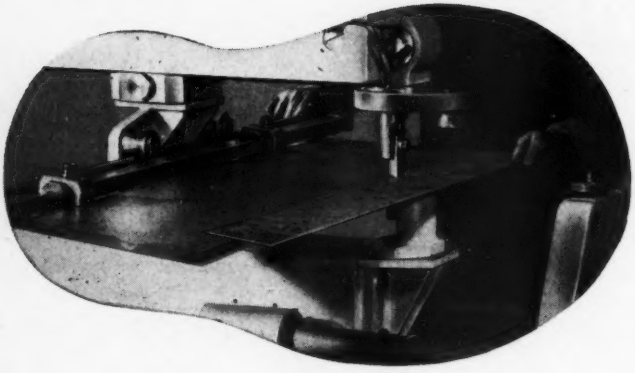

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The Trumpf Universal Shearing, Nibbling, Flanging and Forming Machines, Model TAS, will perform these operations on ONE MACHINE WITH THE NECESSARY TOOLS, OR ON SEPARATE MACHINES TOOLED FOR ONE PARTICULAR JOB . . . just right for experimental or batch production. Fast, clean, accurate work, saving much time and the extreme cost of heavy presses and tools.

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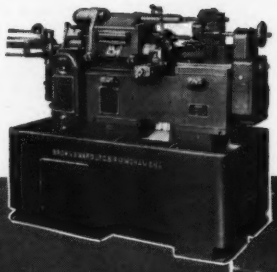
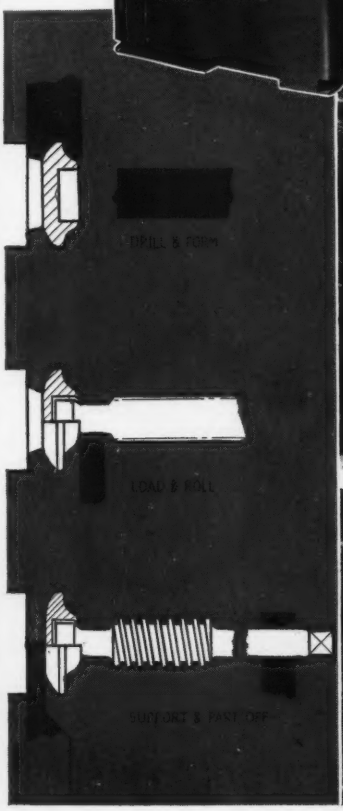
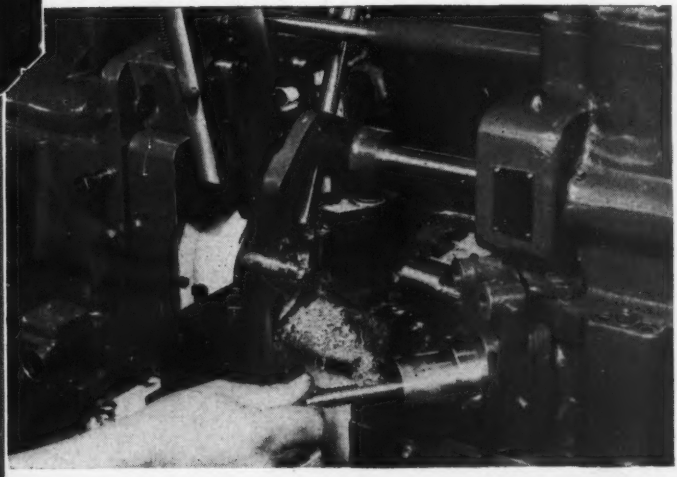
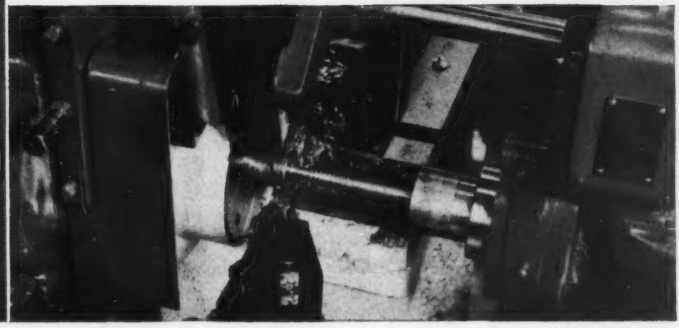


simplicity of repetition machining on—







A Brown & Ward 1¼in. 4-Operation Bar Automatic produces brass clack valves at the rate of 3.6 components per minute.

After the forming and drilling, the machined stem is loaded into the loading head on the turret and inserted in the valve body.

The wall of the valve head is peened over the edge of the stem, prior to parting-off.

BROWN & WARD
single-spindle BAR AUTOMATICS

Uses simple standard cams and tools.

Wide range of attachments increases versatility.

Competitive to six-station machines relative to low capital outlay.

Six sizes, three types, for work up to 1½" dia. x 4½" long.

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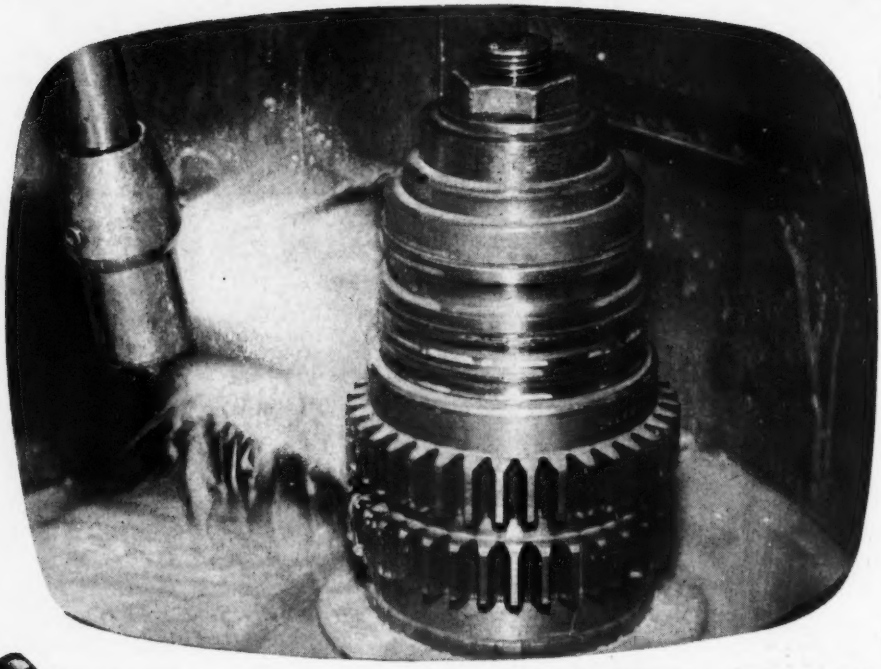

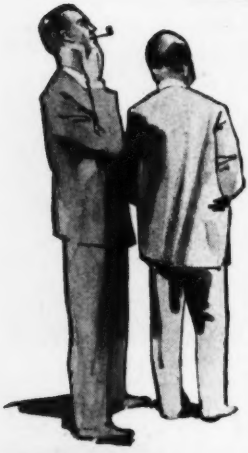

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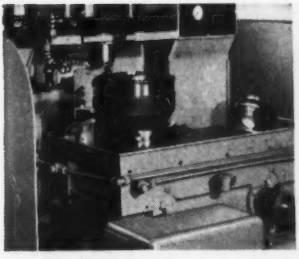
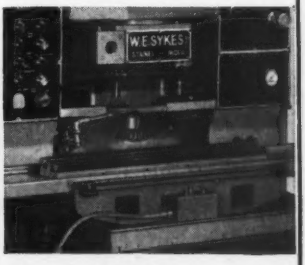
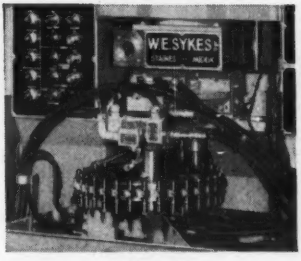
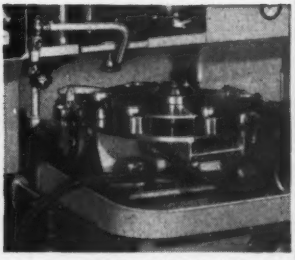

SEMI-AUTOMATIC



RACK-CUTTING



SYKOMATIC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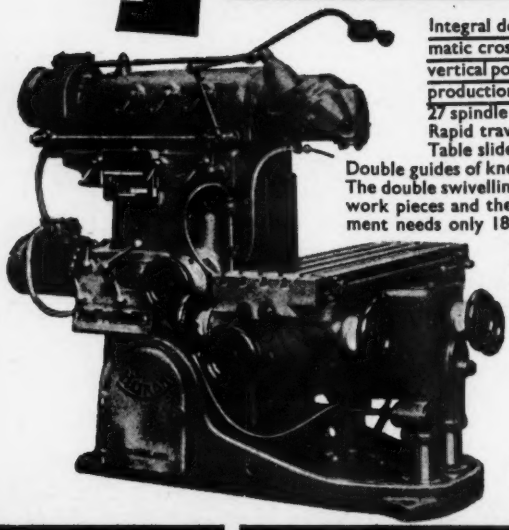
SLIDING RAM GIVES 27½in. AUTO CROSS FEED

HEAVY DUTY MILLING

ANGULAR COMPOUND HORIZONTAL VERTICAL

HURON SUPER UNIVERSAL MILLERS



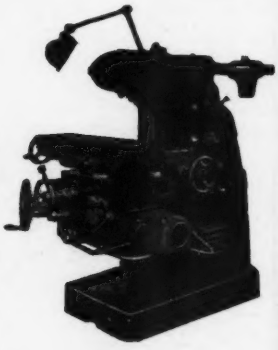
Integral double swivelling universal head provided with 27½in. automatic cross feed by the sliding ram, can be set to the horizontal or vertical position, or to any angle instantaneously—permits the heaviest production cuts. Head can be retracted completely from table line. 27 spindle speeds from 30 to 2,066 r.p.m., 27 feeds from $\frac{1}{16}$in. to 30in. Rapid traverses in all directions. All operating controls duplicated. Table slides directly in the knee without cross movement or swivel. Double guides of knee permit components in excess of 1½ tons to be machined. The double swivelling universal head requires an opening of only 14in. to enter work pieces and the whole sliding ram with its 27½in. automatic cross movement needs only 18in. clearance. OPTIONAL EXTRA FEATURES: Mounted spacing casting assemblies providing additional 8in. capacity under spindle. 26in. wide 8 T-slot tables and 39½in. automatic cross feed of sliding ram with special heavy duty knee and front operating position.

Type	Table	Automatic Feeds Long	Cross	Vert.
KU4	56½in. × 15½in.	43½in.	27½in.	19½in.
KU5	64½in. × 15½in.	51½in.	27½in.	19½in.
KU6	78½in. × 16½in.	59in.	27½in.	19½in.
KU55	64½in. × 26in.	51½in.	38½in.	18½in.
L83	157in. × 59in.	118in.	39½in.	59in.

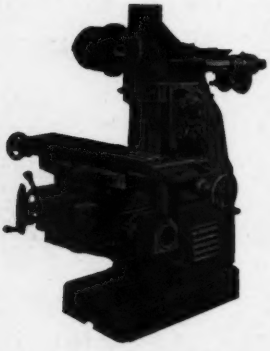
Type 'L' Open-side Traversing Head Universal Miller will mill, bore, slot and drill the largest work-pieces at one setting. The unique design permits greatest variety of operation on large work-pieces; the component remains stationary on the large work-table. Upright slides full length of base table and the sliding ram moves vertically and horizontally.

DUFOUR UNIVERSAL MILLERS

WITH DOUBLE UNIVERSAL SWIVELLING HEAD, RETRACTABLE SLIDE BRACKET AND SPACING CASTING GIVING 26" DAYLIGHT ON No. 59 AND 21" ON No. 61



FOR ALL MODELS Direct reading dial change for speeds and feeds. All parts subject to wear hardened and ground and completely interchangeable. Built to closest tolerances. Rapid traverses in all directions. Table swivels 30°. No. 40 taper for main horizontal spindle, double swivelling universal head, dividing head and rotary table. Hardened and ground centre guide for slideways. Twin overarms. Double swivelling sliding spindle heads with speeds 53-3000 r.p.m. Double swivelling universal head on retractable slide bracket providing with 5½in. Spacing Casting Drive assembly on 59 Machine 26in. daylight, and 21in. on No. 61.



MODELS 53 & 61. 16 universal head spindle speeds 21-1600 r.p.m.; 8 horizontal spindle speeds 21-1180 r.p.m.; 8 automatic feeds ½-18¾in.

MODEL 59. 36 universal head spindle speeds 14-1780 r.p.m.; 12 horizontal spindle speeds 21-1180 r.p.m.; 16 automatic feeds ½-20in.

MODEL 54. Automatic cross feed of universal head 20in.; 18 universal head spindle speeds 12-1500 r.p.m.; 36 horizontal spindle speeds 6-1500 r.p.m.; 18 automatic feeds $\frac{1}{16}$-23¾in.

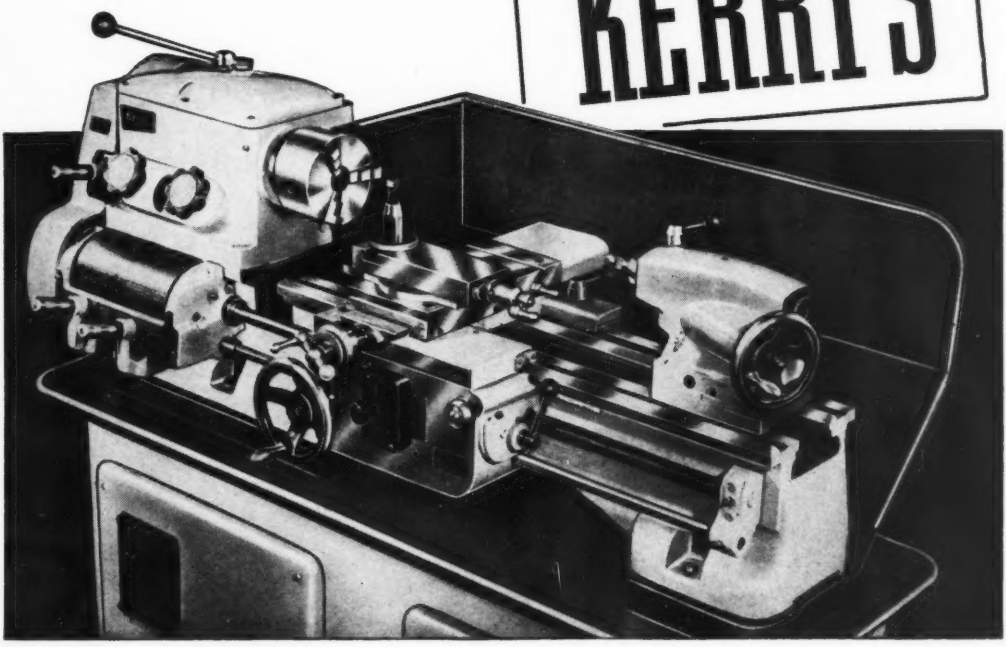
Type	Table	Automatic Feeds Long.	Cross	Vert.
53	43½in. × 9½in.	27½in.	9½in.	15½in.
61	47½in. × 10½in.	30½in.	9½in.	15½in.
59	51½in. × 11½in.	34½in.	11¾in.	21½in.
54	67in. × 14½in.	43½in.	14½in.	20½in.

Send for full particulars of our very extensive range of these machines; ask for demonstration.

Rudolph Carne & Co. Ltd. SWAN WORKS, FISHERS LANE, CHISWICK, LONDON, W.4.

Telephone: CHISWICK 0514 & 6585. Inland Telegrams: RUDCAR, CHISK, LONDON. Overseas Telegrams: RUDCAR, LONDON.

MORE AND MORE ARE TURNING TO KERRY'S



11" SWING LATHES

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★ SLIDING, SURFACING AND SCREWCUTTING LATHE

★ ALL GEARED HEADSTOCK GIVING 9 SPEEDS RANGING FROM 39-1500 r.p.m.

★ TYPE LOO PRECISION TAPERED SPINDLE NOSE

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★ CAMLOCK TAILSTOCK

★ BEDWAYS AND SLIDES PRECISION GROUND

★ HARDENED BEDWAYS OPTIONAL EXTRA

KERRY'S

manufactured within the KERRY GROUP by
KERRY'S (Engineering) CO. LTD
GRANGE ROAD, LEYTON, LONDON, E.10

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O & S

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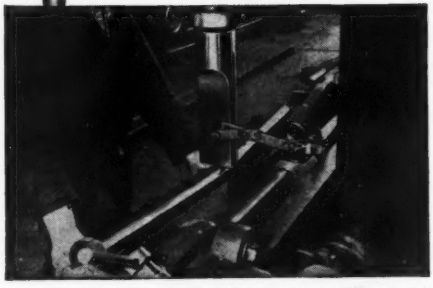
O & S Straightening Presses, made in 5 sizes with capacities ranging from 4 to 60 tons pressure, have for many years been the first choice of engineering firms throughout the world, including most of the leading motor manufacturers. For speed, accuracy and ease of operation, O & S Straightening Presses are in a class of their own.



In the Leicester works of Frederick Parker Ltd., O & S Straightening Presses are in daily service ensuring that steel shafts are perfectly straight and true.

O & S

manufactured within the KERRY GROUP by
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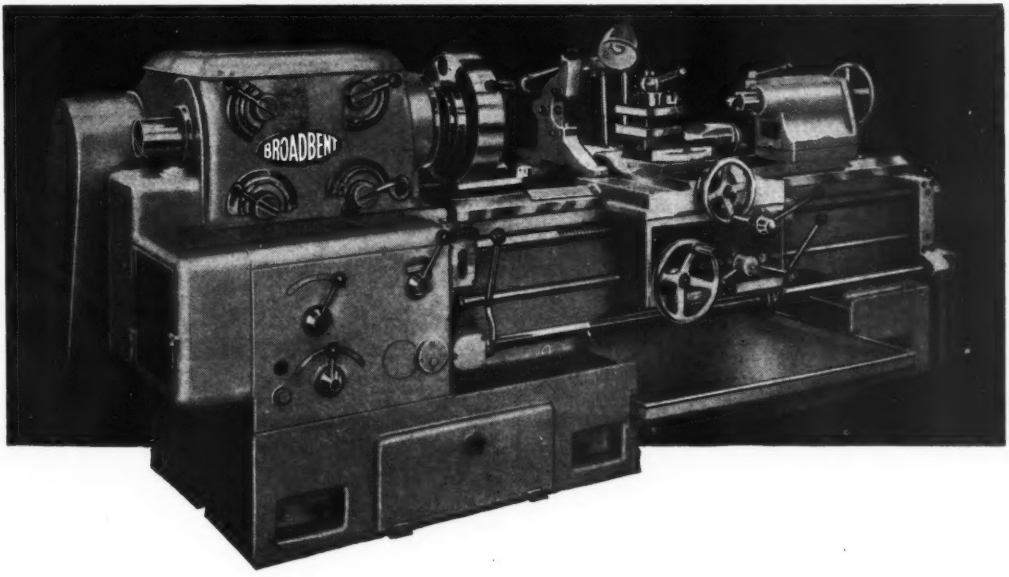
Good men plus good tools equal good output. Every Broadbent lathe incorporates almost a century of machine tool building. Manufacturers know that for versatility, accuracy and reliability there is nothing quite as good as a Broadbent Machine Tool.

BROADBENT

LATHES



This 18/22″ Swing Heavy Duty Centre Lathe of modern design is a typical example of the Broadbent range. It has a 15 h.p. drive motor and spindle speeds up to 1,000 r.p.m.

The Broadbent range of Machine Tools includes Surfacing and Screw-cutting Lathes from 17″ to 72″ swing, Surfacing and Boring Lathes, Break Lathes, Crankshaft Lathes and vertical Turning and Boring Mills with 5′, 6′, 8′ or 10′ capacity.

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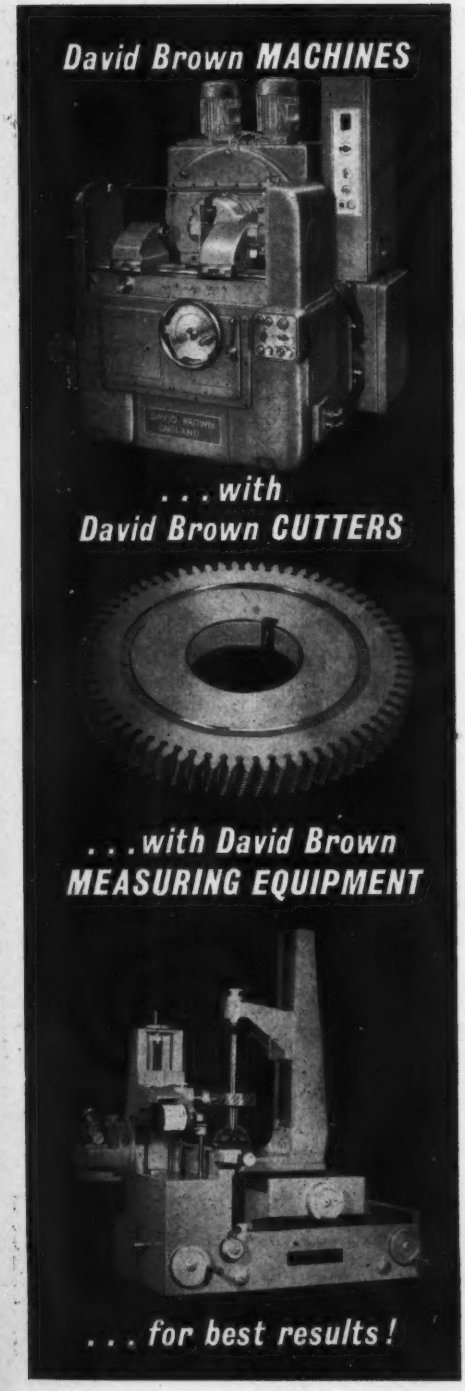

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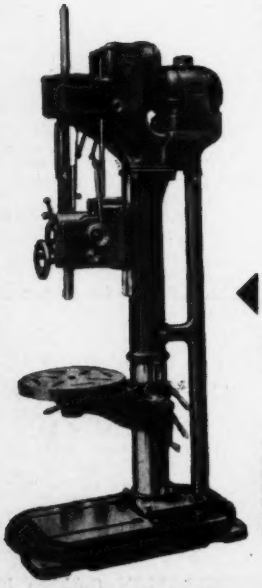

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HEAVY DUTY GENERAL PURPOSE DRILL

With a drilling capacity of up to 2in. in M.S., these machines have nine spindle speeds up to 489 r.p.m. and six automatic feeds, with electric reverse if required. Ball bearing mounted gear drive. Available in gang drills with two to six columns on one base. Two other models available, with capacities of 1¾in. and 1¼in. respectively.

MODEL 21 AR
ROUND COLUMN MACHINE

Available in three sizes with capacities of 1¾in., 1¼in. and 2in. respectively. Similar in performance and characteristics to the box column machine.

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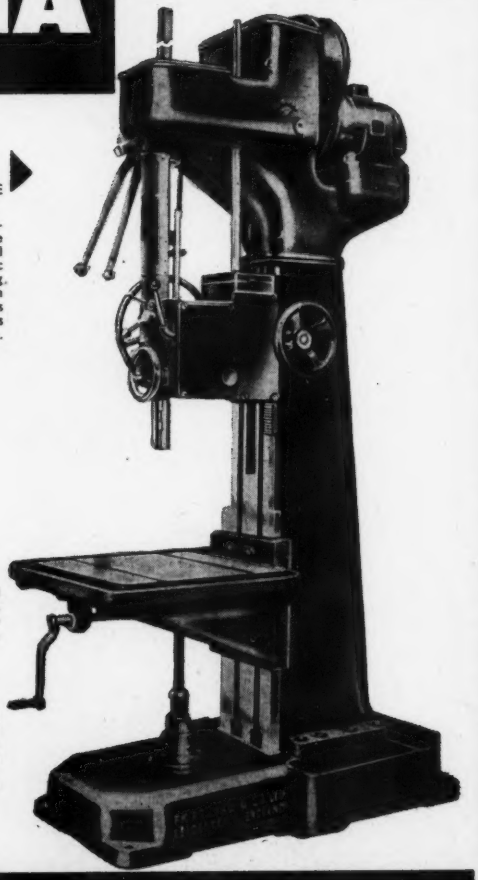

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ABRIDGED DATA

Type	Delay at 20°C Min.	Max.	Heater Voltage
S.102/1G*	44	66	6·3
S.102/1K	44	66	6·3
S.103/1K	36	54	27
S.104/1K	25	35	6·3
S.105/1K	20	30	27
S.106/1K	44	66	19

* Flying Lead Version

Ask for application report MS 117

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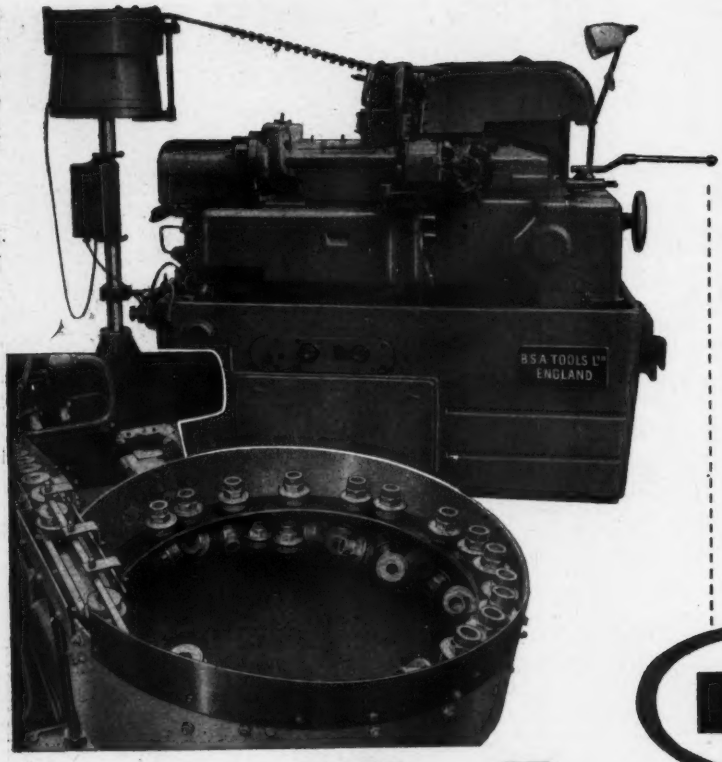

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R.H. 582 RPM.

CYCLE TIME: 20 SECONDS.

B·S·A

Top: B.S.A. No. 98L automatic arranged to produce the subject component is equipped with pneumatic workspindle-positioning attachment for stopping and locating the spindle with chuck jaws in a position of definite relation to tooling or, as in this example, the component.

Above: Vibratory hopper feeds the components to gravity chute.

Right: Air operated escapement releases components singly to a carrier on the third slide. Component is pushed into the chuck (positioned to receive the hexagon) by a ram in the turret. Thread cutting attachment is on front slide.

single spindle automatics

Made in several sizes and variations to suit the purpose

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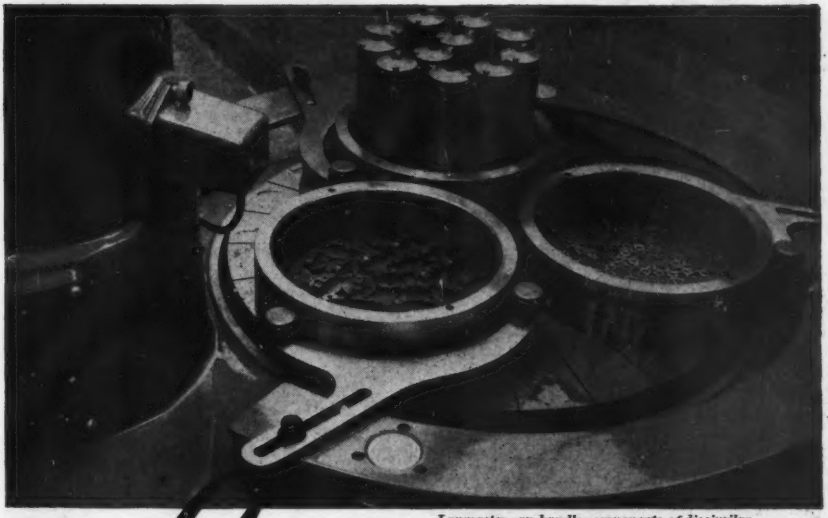

Lapmaster can handle components of dissimilar shapes and dissimilar materials simultaneously.

with Lapmaster

Lapmaster produces a high order of flatness, and surface finish, on turned, milled, ground and even cast components. Both in quality and in cost, hand-lapping and other production methods are outstripped by Lapmaster.

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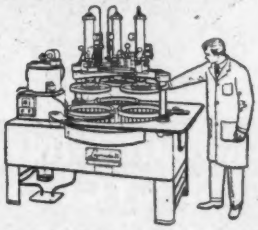

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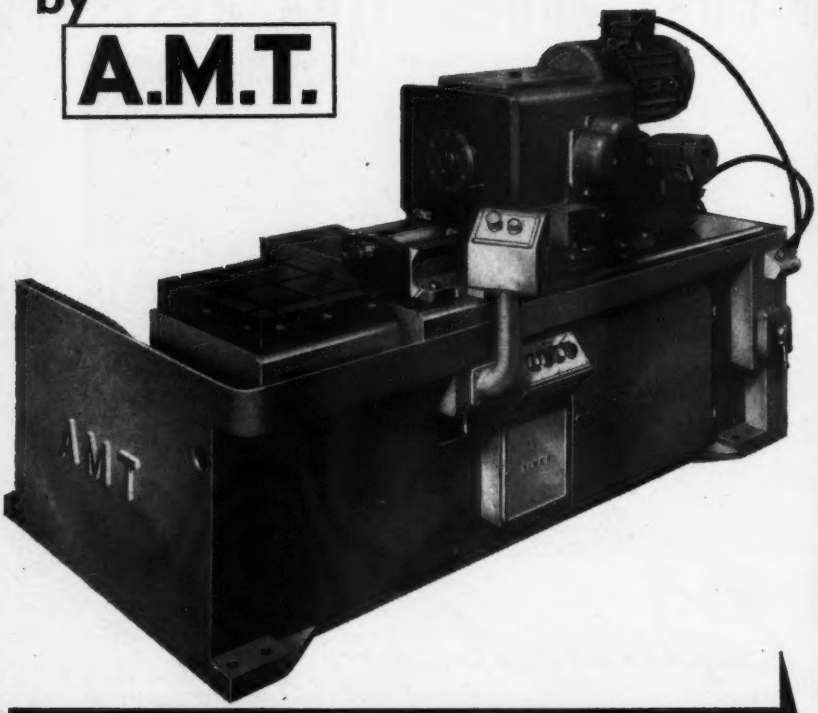
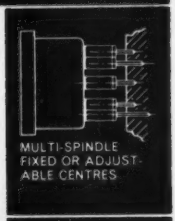
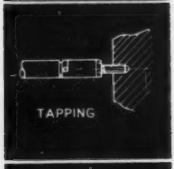
THE "MULTI-CYCLE" UNIT MACHINE

by **A.M.T.**







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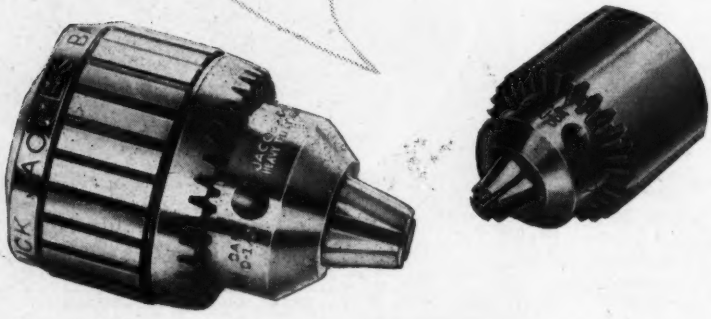

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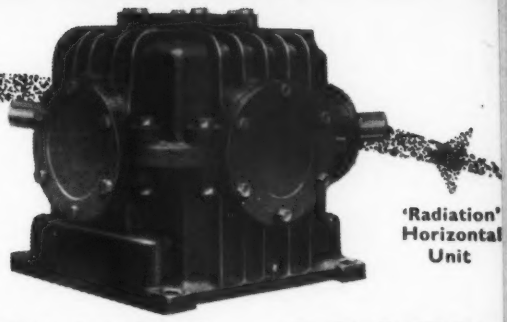
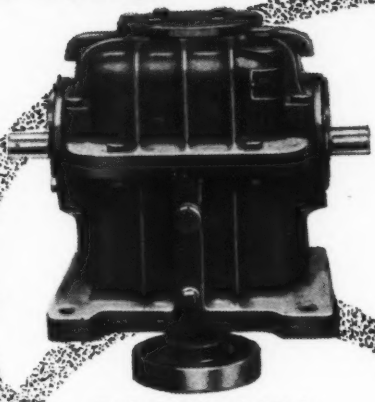
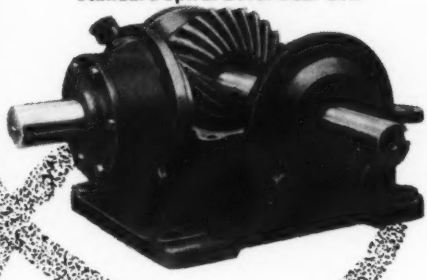


'Radiation' Horizontal Unit



'Radiation' Vertical Unit

Standard Spiral Bevel Gear-box



If you are watching costs you will do well to install Crofts " RADIATION " Spiral Bevel Gear Units. They are precision generated to give accurate and continuous tooth engagement; they lower noise levels, reduce maintenance and production costs, and ensure the optimum use of expensive power.

Available in both horizontal and vertical types, these units transmit powers from fractional to 1,100 h.p. and provide speed ratios from 1 : 1 to 5 : 1.

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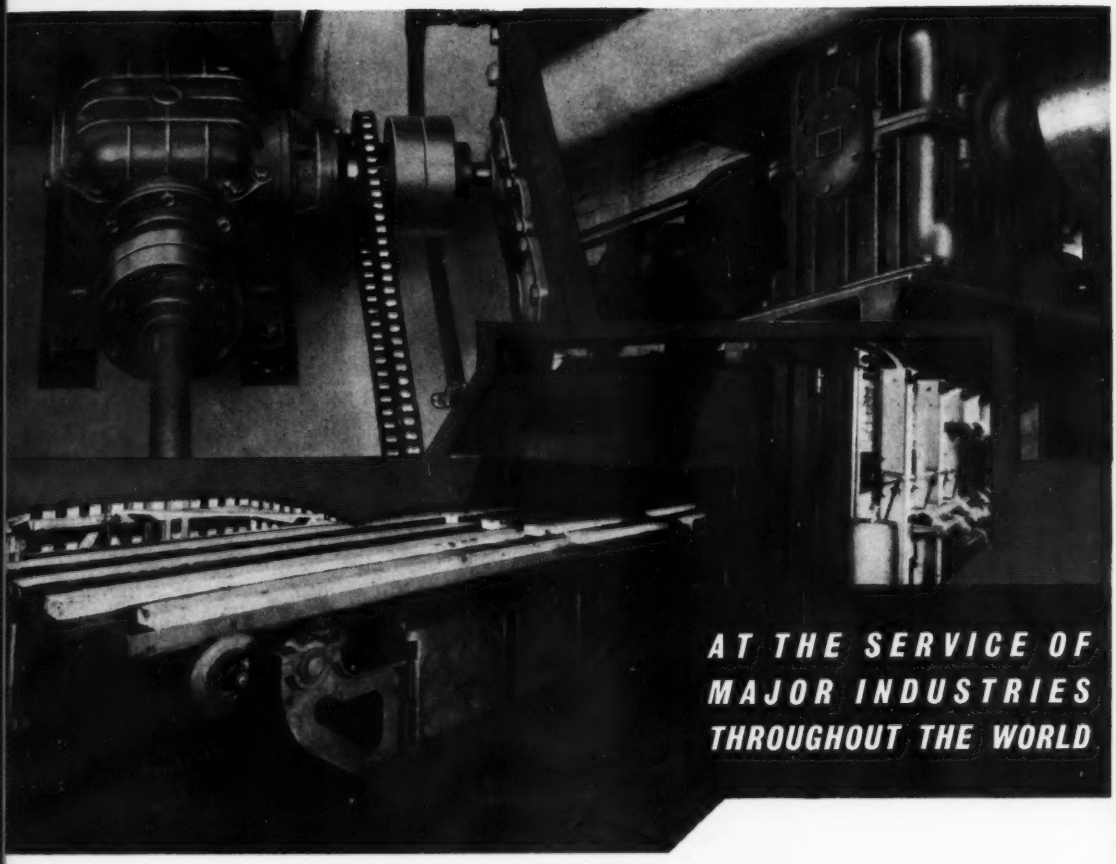

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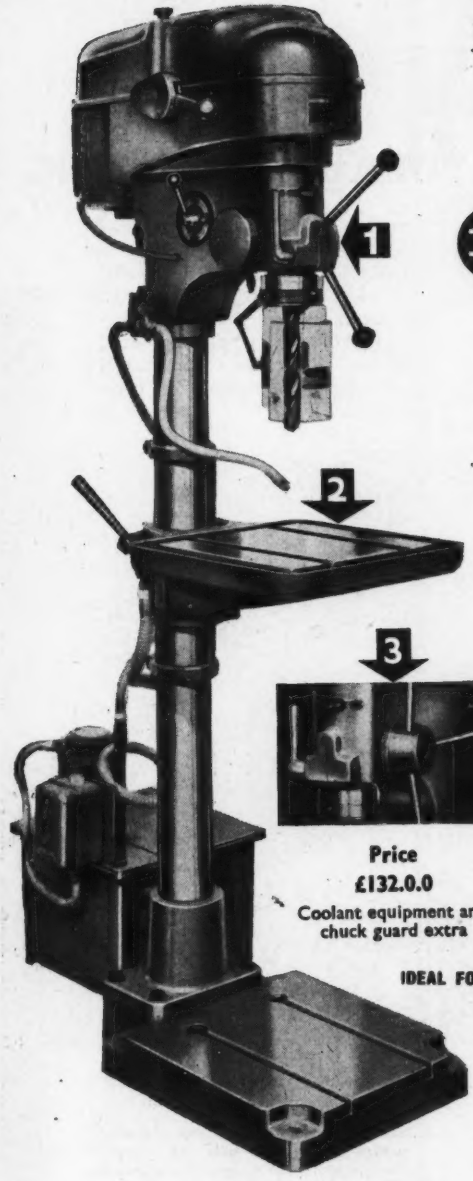

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3% CHROMIUM MOLYBDENUM NITRIDING STEEL

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3% CHROMIUM MOLYBDENUM NITRIDING STEEL

Type of Steel	Typical Core Strength 1½" dia. bar tons/sq. in.	Diamond Pyramid Hardness after Nitriding 100/10
% C., 1½% Cr.Al.Mo.	80	"
1% C., " "	60	"
1·3% C., " "	50	"
0·2% C., " "	40	850/950
0·4% C., 3% Cr.Mo.V.	90	800/850
0·3% C., 3% Cr.Mo.	60	"
0·2% C., " "	50	

These steels have been evolved to make the very best use of the Nitriding process of surface hardening by treatment of parts in an Ammonia atmosphere at about 500°C and subsequent cooling at room temperature.

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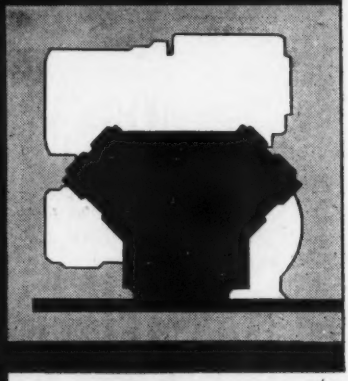
. . . the DT4 compressor looks after itself

Here's a compressor you can install—and then forget about. Suitable for 24 hours a day continuous operation. The DT4 delivers 565 cfm, and is a fully air-cooled, short-stroke, two-stage machine. Weighing 2,200 lb. it occupies 30-50% less space than most compressors of similar capacity. No special base is needed, it can be fitted with a frame mounting and rubber feet, thus enabling it to be moved from place to place. The DT4's compact design allows easy passage through mine shafts, drifts and similar places. It is an ideal compressor for mining and contracting work.



Important Space Savings

The economy in space offered by the Atlas Copco DT4 is convincingly demonstrated by the silhouette of a DT4 (shown right) superimposed on the outline of a conventional compressor of equal capacity.
For further information on the DT4, write for a copy of leaflet E1208. It is readily available from your local Atlas Copco branch or from the address below.

s/213

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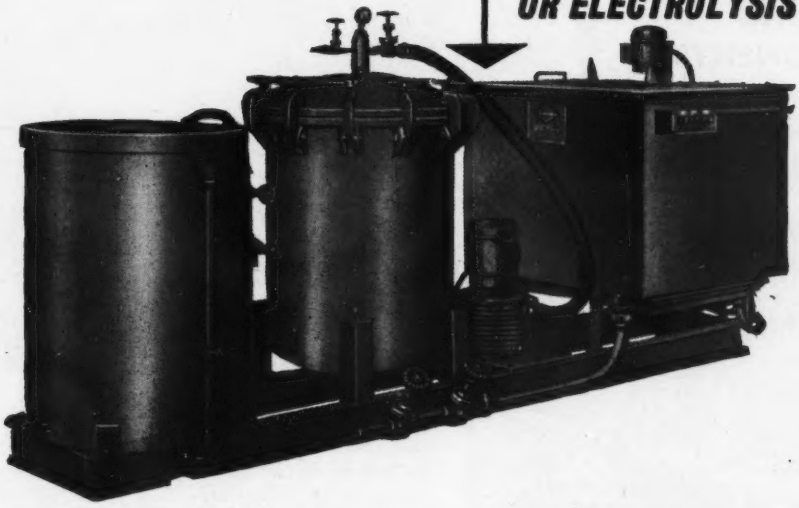
puts compressed air to work for the world

new Impregnation Process for Porous Castings

THE NEW MOGUL CAST SEAL PROCESS IMPREGNATES CASTINGS *WITHOUT BAKING* *WITHOUT DISCOLOURATION* *WITHOUT RUSTING* *OR ELECTROLYSIS*



The MOGUL CAST-SEAL Impregnating Process utilises a metallic colloidal solution, which is pressurised round and through the castings and permanently seals leaking and porous places. The solution penetrates into the leaks and builds up a metallic seal right through the wall.

Ferrous and non-ferrous castings can be treated in 45 minutes without preparation (other than de-greasing where necessary) and do not require subsequent baking or cleaning. The process does not affect the appearance of the castings in any way.

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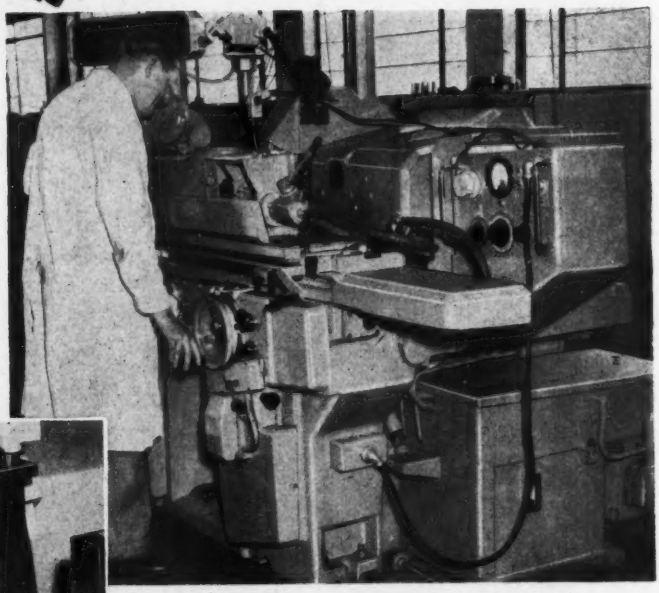
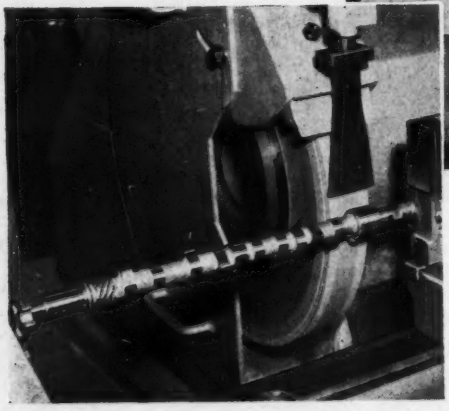
GRINDING COMPONENTS for the RELIANT MOTOR CAR





The model 1049 Pr duction Grinder installed is a standard model equipped with full clearance hydraulic tailstock, 3" wide wheel and complete with electronic sizing equipment.

The Reliant Engineering Co. Ltd. who manufacture the very popular three-wheel Reliant motor car have installed in their works a JONES-SHIPMAN MODEL 1049 PRODUCTION GRINDING MACHINE for grinding many of the components for use in their sub-assemblies such as Differential axle units, Gearboxes, Engines, etc. Typical of these components are illustrated above. The grinding operation above shows the grinding of the camshaft bearings.

J & S

JONES — SHIPMAN

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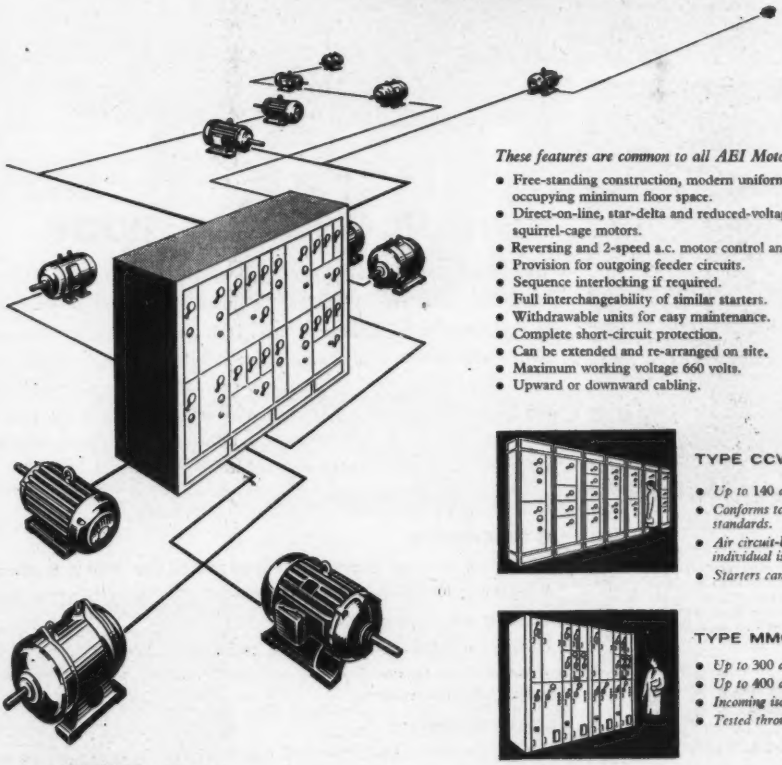
So many advantages with AEI Multi-motor control



These features are common to all AEI Motor Control Centres:

- Free-standing construction, modern uniform appearance, occupying minimum floor space.
- Direct-on-line, star-delta and reduced-voltage starting for squirrel-cage motors.
- Reversing and 2-speed a.c. motor control and slip-ring motor starting.
- Provision for outgoing feeder circuits.
- Sequence interlocking if required.
- Full interchangeability of similar starters.
- Withdrawable units for easy maintenance.
- Complete short-circuit protection.
- Can be extended and re-arranged on site.
- Maximum working voltage 660 volts.
- Upward or downward cabling.

TYPE CCW

- *Up to 140 amps motor circuits.*
- *Conforms to American N.E.M.A. standards.*
- *Air circuit-breakers or switch-fuses for individual isolation and protection.*
- *Starters can be arranged back-to-back.*

TYPE MMC series 1000

- *Up to 300 amp. motor circuits.*
- *Up to 400 amp. feeder circuits.*
- *Incoming isolator or circuit breaker.*
- *Tested through-fault capacity.*

AEI **Associated Electrical Industries Limited**
Motor and Control Gear Division
RUGBY & MANCHESTER

A 5330

A condenser manufactured by The A.P.V. Company Limited, Crawley, Sussex. The complete installation incorporated 47,000 feet of PERMBRITE *welded stainless steel tube.*

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Are YOU using welded tube economy?

Today in countless uses welded stainless steel tube is specified in preference to solid seamless tube. It is also considerably cheaper. That's why more and more progressive industries are using PERMBRITE tube. They know that, with today's enormous progress in welding techniques, this tube is not only equal to 'solid seamless' in strength—but is generally more consistent and uniform in wall thickness, with no inclusions. Are *you* up-to-date with welded tube economy?

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Exhaustive tests and extensive use have proved the 'weld is as strong as the wall'—and as resistant to corrosion.

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Welded tube can be used for heat exchangers, corrosive plant, high pressure uses, chemical piping—all those exacting uses which once demanded 'solid seamless.'

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Because the tube is made from precision steel strip—you can depend on a uniform thickness of wall in welded tube.

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(A member of the Compoflex group of Companies)

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Rust damage in transit brings quick complaints from overseas customers—complaints that can easily be avoided. Rodol rust preventives provide inexpensive treatments that give full protection to metal parts or assemblies. There is a full range of RODOL anti-rust products including non-drying, semi-drying, and full-drying types. They are all easily applied by brush, spray or dipping. Publication SP.176 will help you to choose the correct grade—write for a copy.

USE **RODOL** AGAINST RUST

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Telephone: HYDE 3471 (5 Lines) *Telegrams*: EMULSION, HYDE

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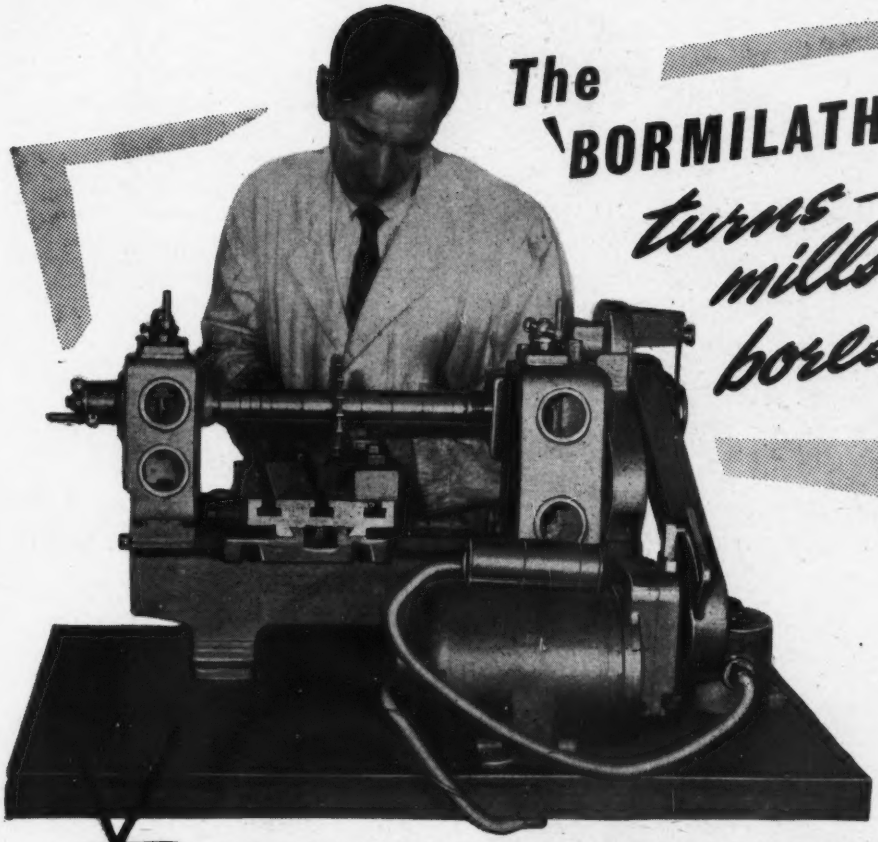

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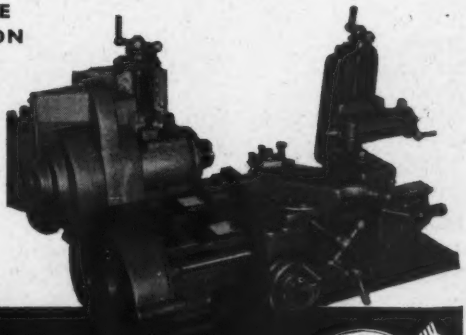
● FULL SCREW CUTTING FACILITIES ● VARIABLE CENTRE HEIGHT ● AUTOMATIC SLIDING MOTION TO SADDLE ● A really practical universal machine tool to cut costs on experimental, toolroom and production work. Powerful construction throughout . . . backed by the MURAD 'know how' of building high class machine tools for a quarter of a century.



CAPACITY

Height of centres	variable from 3¼in. to 7in.
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Swing over ways	14in.
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Full screw cutting capabilities	

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All castings are made by the "Meehanite" process in our own well-equipped foundries. The Butterley foundries are available for the production of high-grade "Meehanite" castings to customers' requirements.

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We invite your enquiries for "Meehanite" castings of all grades up to 20 tons.

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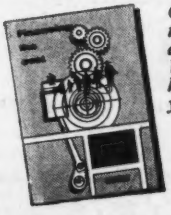
When you're adding to your plant, or purchasing new machines there's no need to make big inroads into your capital. Acquire them instead with the help of British Wagon Finance, and leave those valuable reserves to work in other ways. The terms of the B.W. Finance Plan are extremely economical. Flexible too, and everything is so straightforward. The manager of your local British Wagon branch is always ready to give you friendly and practical advice. Have a word with him.



Our leaflet 'Financing the Cost' gives you full details of how the British Wagon Finance Plan can help you. Let us send you a copy.

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Head Office:
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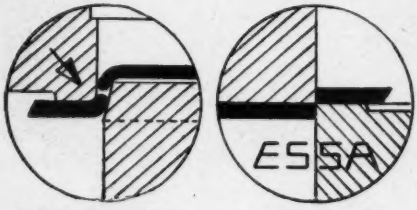
MANY TIMES LONGER TOOL LIFE

The above claim has been confirmed by a large number of tests and by experience of our customers.



FORMERLY: Ordinary Press —tool breakage.

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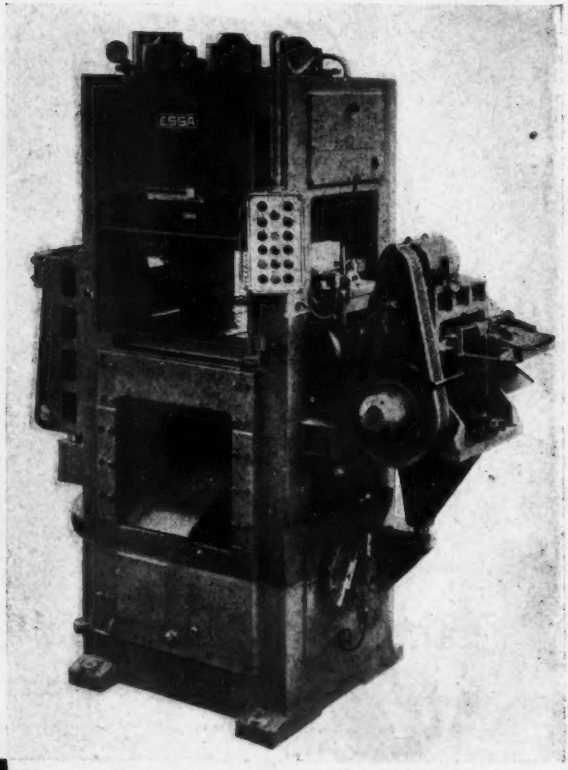
The upwards movement of the ram automatically eliminates vertical backlash, the cause of punch into die penetration.
This feature is especially important when tungsten carbide tools are used.



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MODELS BHA 30, 60, 120, 180t.

FULL DETAILS GLADLY SENT ON REQUEST OR A DEMONSTRATION READILY ARRANGED.

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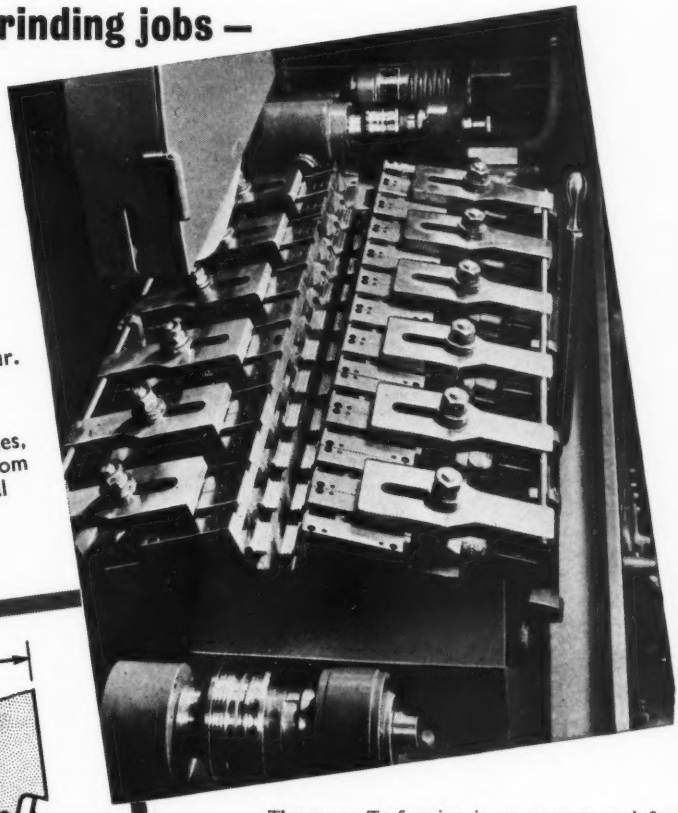
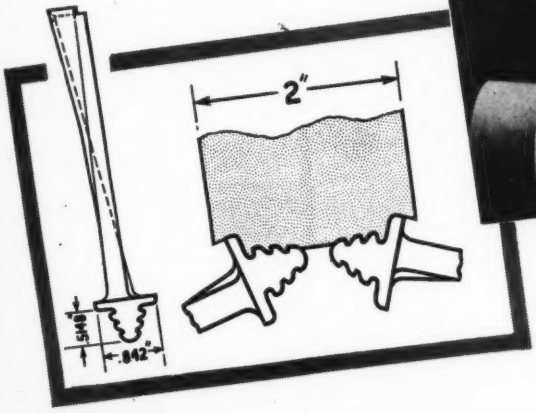
save time on form grinding jobs —

PART NAME: Jet Engine Blade.
METHOD OF HOLDING: 24 Place Fixture.
METHOD OF GRINDING: "Truforming" Two Rows (12 per row) from Solid — ·100 in. Stock Removal per Side.
MACHINE SIZE: Type "C" 12 x 16 x 44 Truform Grinder.
PRODUCTION: 33 pieces per hour.
NUMBER OF PIECES PER WHEEL DRESSING: 96.
CRUSHER ROLL LIFE: 864 pieces, before regrinding Work Roll from Reference Roll to restore initial accuracy.





Thompson Truforming is an accurate and fast method of producing identical parts by transferring the shape or form of a preformed crushing roll first to the grinding wheel and then to the work. The crushing process produces a very free cutting wheel which gives an exceptionally high rate of stock removal.

It has many time-saving and product-improving applications, including the elimination of difficulties encountered in maintaining tolerances as grinding is carried out after hardening.

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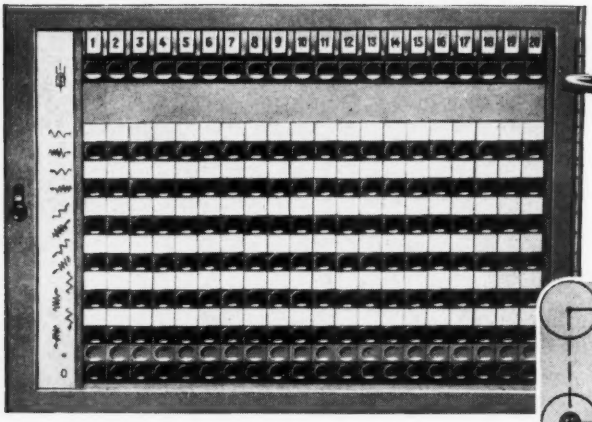
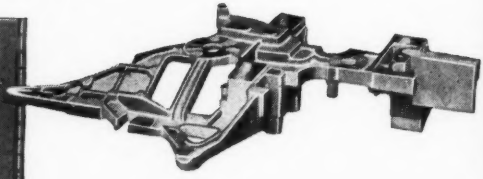
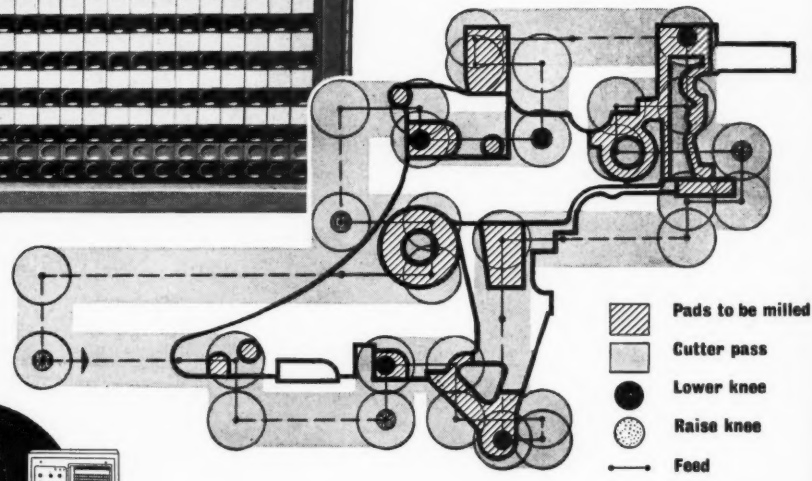
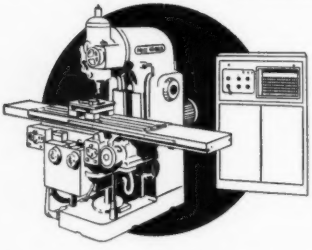
WERNER 3-D Low Capital Cost Programme-controlled MILLING







Cutter pass and rise-and-fall motions of the knee during automatic 3-dimensional programme milling of the workpiece shown above right.



Machines with table sizes from 43" x 12" —98" x 24" can be supplied with automatic 3-dimensional programme controlled milling.

- No tape, wire or punched cards
- Suitable for small or large batches
- Production times reduced by as much as 60-70%
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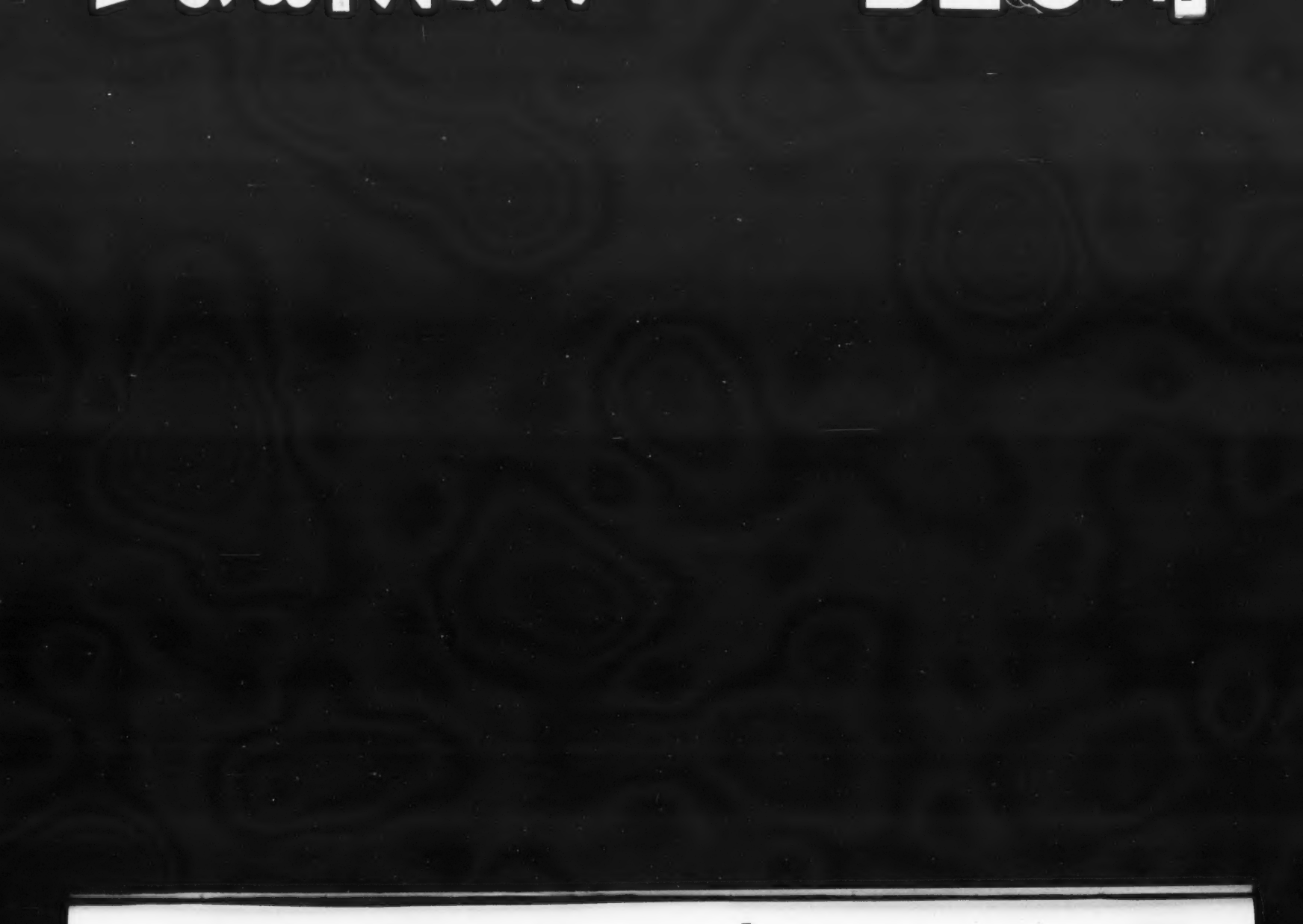

7th EUROPEAN Machine Tool Exhibition

Intending visitors are strongly recommended to make hotel reservations as soon as possible. The appointed agents are Thos. Cook & Son Ltd.

Copies of the official exhibition catalogue will be available in early August. Applications should be forwarded now to the Commissariat General de la 7eme Exposition Europeenne de la Machine-Outil, 13, Rue des Drapiers, Brussels, 5. At the same time a transfer of Belgian Frs. 100 to the General Commissariat's Account No. A.26/1617 at Banque de Bruxelles, Brussels should be arranged and confirmed to the Commissariat with your order.

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SPIRO... recognised as the finest and most accurate keyless drill chuck in the world. Six sizes with capacities up to ⅝in. dia.

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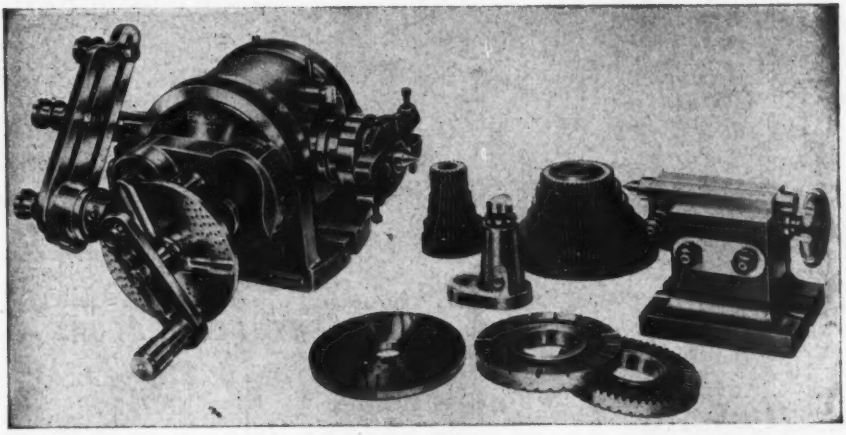
HIGH PRECISION

UNIVERSAL DIVIDING HEADS

MODEL ALFA



SPECIFICATION	ALFA 1	ALFA 2	ALFA 4	ALFA 5	ALFA 7	ALFA 9
HEIGHT OF CENTRES	4½"	5¼"	5⅝"	6¼"	7"	7⅜"
BORE OF HOLLOW SPINDLE	⅝"	1 1/16"	1 1/16"	1 1/16"	1 1/16"	1 1/16"
MORSE TAPER IN SPINDLE	No. 3	No. 4	No. 4	No. 4	No. 4	No. 4
MORSE TAPER IN TAILSTOCK... ...	No. 1	No. 2	No. 2	No. 2	No. 2	No. 2
DIVISION RATIO	1 : 40	1 : 40	1 : 40	1 : 40	1 : 40	1 : 40
DIVISIONS OBTAINABLE...	2-400	2-400	2-400	2-400	2-400	2-400
APPROXIMATE WEIGHT...	114 lbs.	161 lbs.	255 lbs.	260 lbs.	270 lbs.	280 lbs.
PRICE	£160	£180	£250	£275	£295	£310

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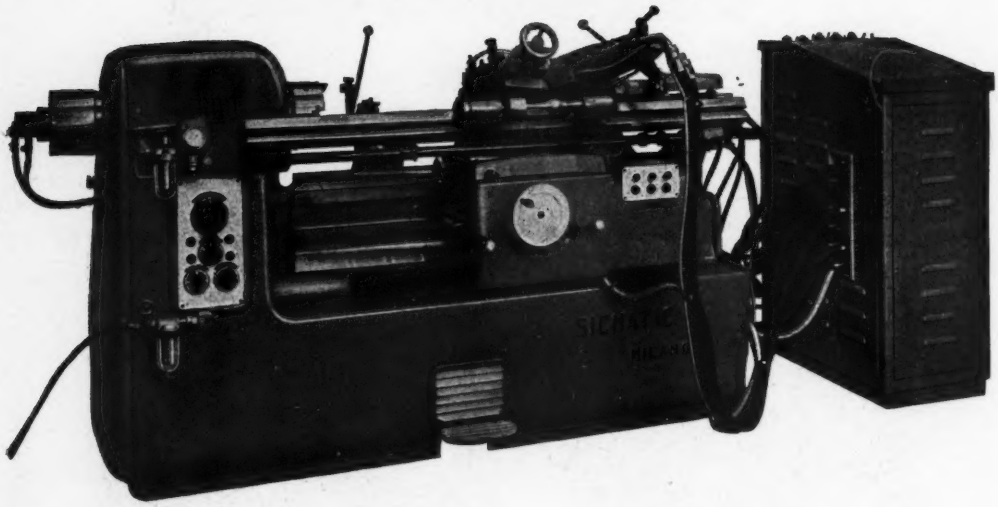
The NEW SICMATIC



Automatic and Semi-Automatic Hydraulic Profiling Lathes

Specification

Bore of spindle	2¼in
Spindle nose	5in. A.S.A.
Max. swing over bed	15¼in.
Max. swing over saddle	9¾in.
Max. length turned	27½in.
Hydraulic traverse of copying slide	4in.
Hydraulic feed of tailstock spindle	4¾in.
Number of feed rates to copying slide	48
Max. tool pressure	1,300 lbs.
Approx. nett weight	5,000 lbs.

7 POINT FEATURES INCLUDE

1 Capacity.
2 Duplomatic Hydraulic System.
3 Hardened Bed Slideways.
4 Auto cycling up to six depths of cut.
5 Hydraulic tailstock for drilling and boring.
6 Uses template or existing component.
7 Eight models to choose from.

Basic price under £2,000.

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Attractive price
Quick delivery

All models complete with Standard Equipment including :

- Cos-par Universal Dividing Head
- Vertical Milling Attachment
- Arbor
- Front Support Braces

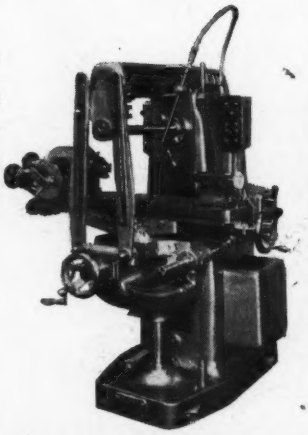
Specification :

Model	No. 0	No. 1	No.
Table	34″ × 8¼″	39⅜″ × 9″	48″ × 11″
Long. Trav.	20″	26″	29″
No. of Speeds	12	9	18
Speeds R.P.M.	32-1000	60-1200	40-2000
Spindle Nose	No. 40	No. 40	No. 40
PRICE ★	£880	£1100	£1825

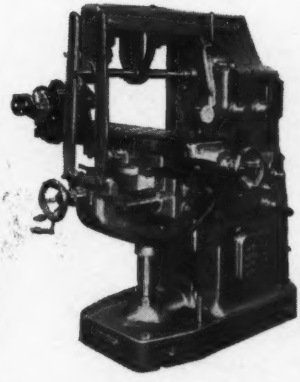
TEST

UNIVERSAL MILLING MACHINES

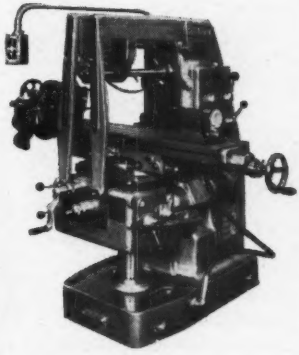
Model 0



Model 1



Model 2



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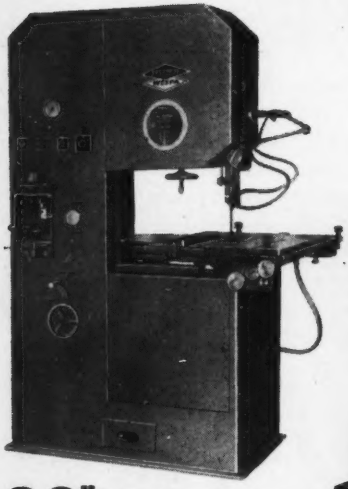
BANDSAWING

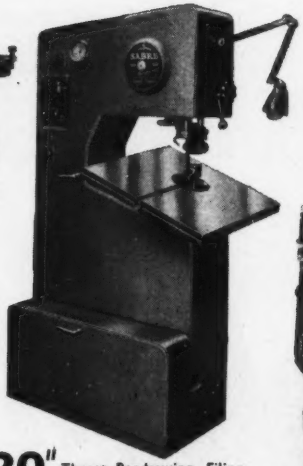
. . . the efficient way of cutting

Recognised as one of the most efficient means of shaping and cutting of all types of industrial material, bandsawing is the fastest and most economical method of internal and external shape forming, whole sections of material being removed in one piece. Using the thinnest type of blade, it penetrates the work piece faster and requires less driving power than any other cutting tool.

28 different production line models are available in the "Startrite" Range.



36" Throat Bandsawing, filing, polishing and Friction cutting with 13¼in. capacity under guides, sliding table, operating in tilted or horizontal position. Table fed by power hydraulics or handwheel and screw. Wide infinitely variable speed range.



20" Throat Bandsawing, Filing and Polishing. 8in. capacity under guides. Auto-set ball bearing upper and lower guides. 10 speed selection. Four-way table tilt. Angled roller guides available eliminating throat restrictions when cutting bars, tubes, sections, etc.

The "Startrite-Meba" Horizontal cut-off Bandsaw. Models SM.250 capacity 10in. diam. SM.320 capacity 12¾in. diam. Steplessly variable speeds. Rapid action vice. Hydraulic control of saw pressure. Full coolant system.

18" Throat Bandsaw. 5¾in. under guides. Upper and lower guides with ball bearing thrust rollers and hardened guide blocks. Tilting table 19in. by 20in. In built welder and grinder. Low voltage spotlight Air Blower. 10 speeds.

12" Throat Bandsaw. 5¾in. capacity under guides. Tilting Table. 10 speeds. Interchangeable Disc Type wheels with bonded tyres. Eight- four- or single-speed models also available.

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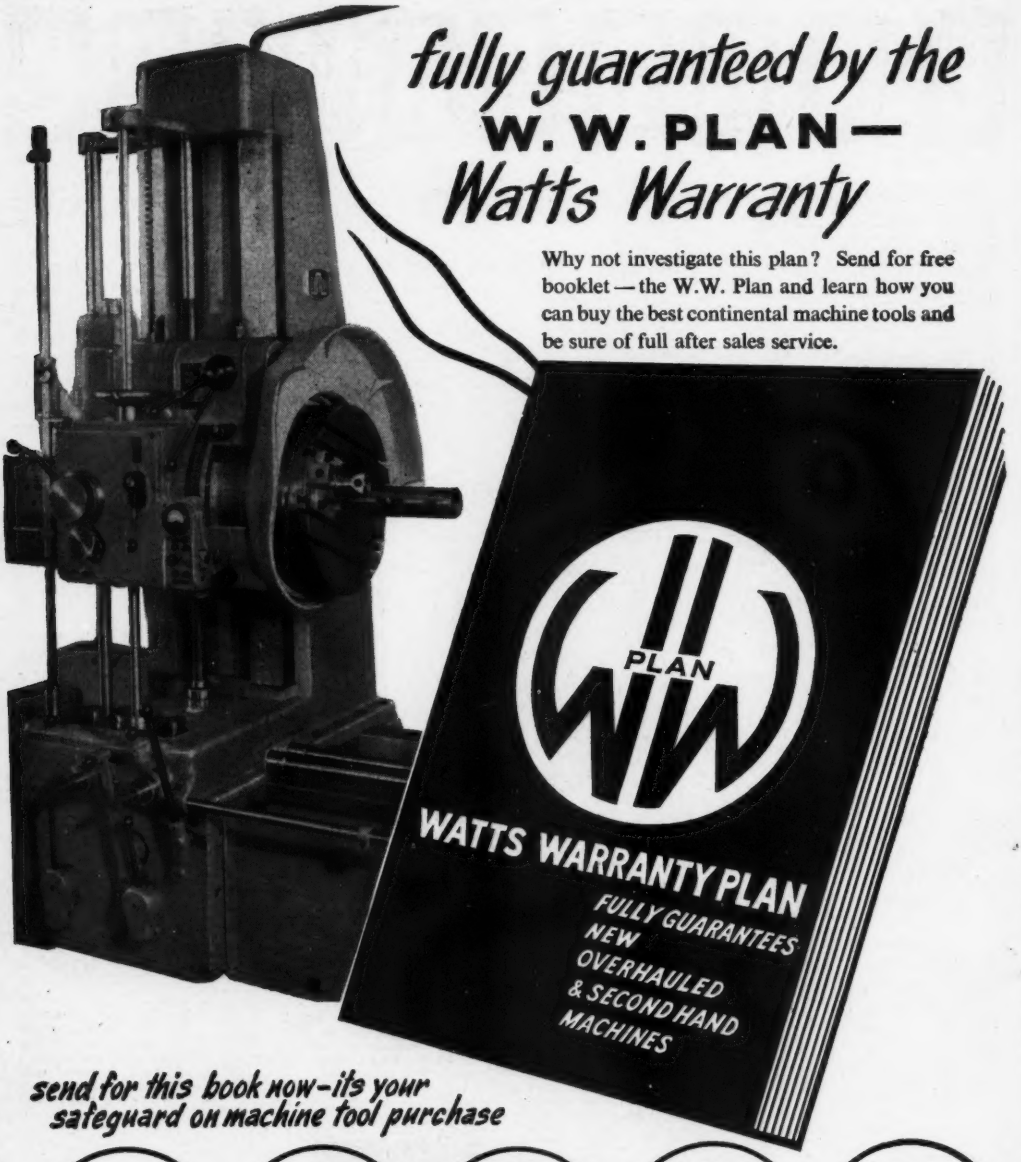

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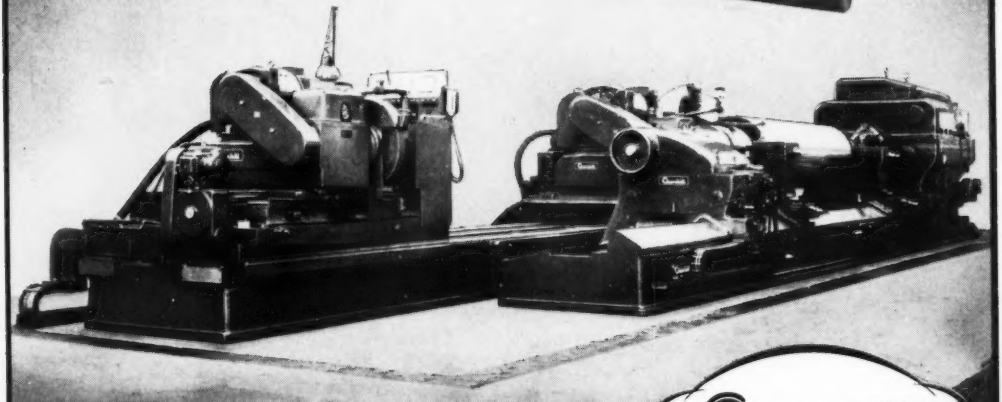

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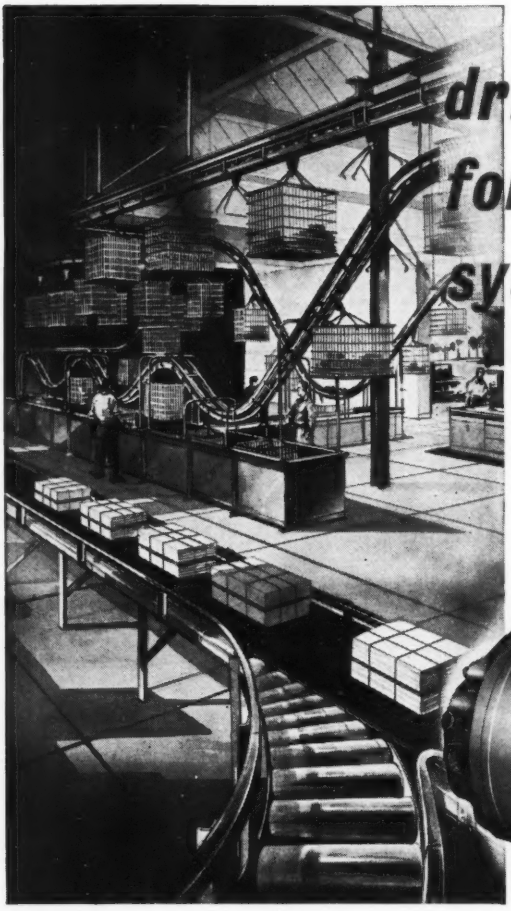

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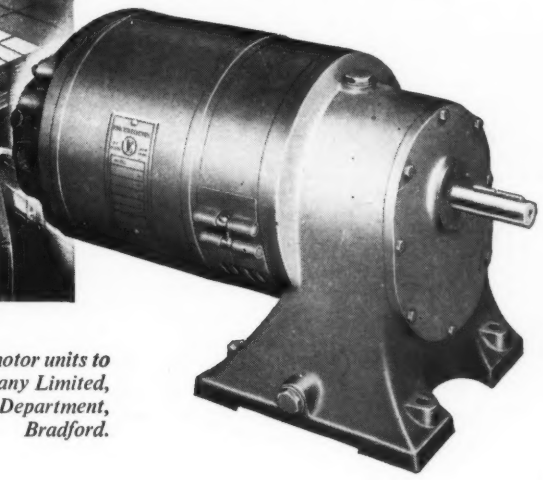

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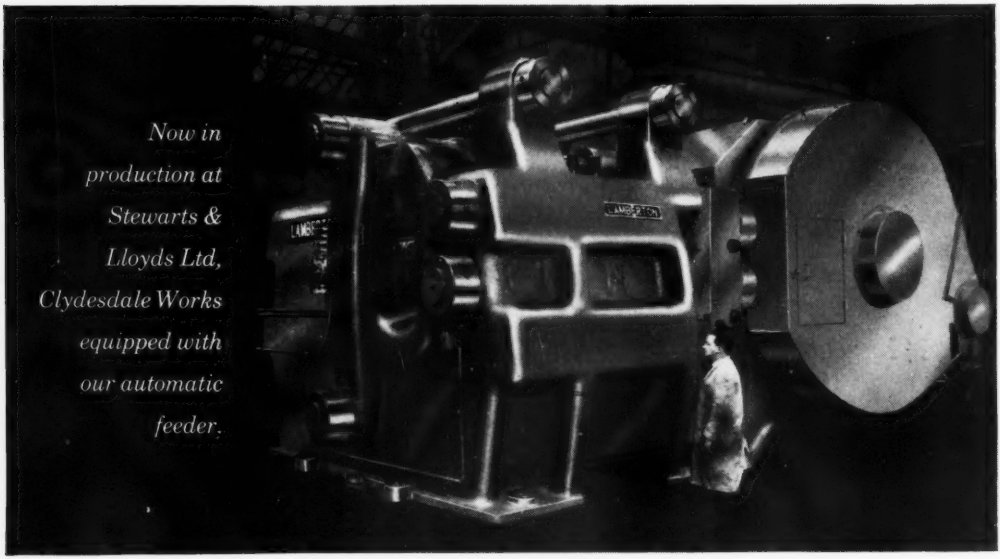

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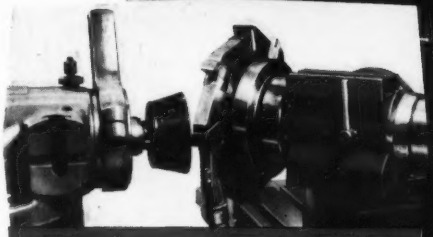

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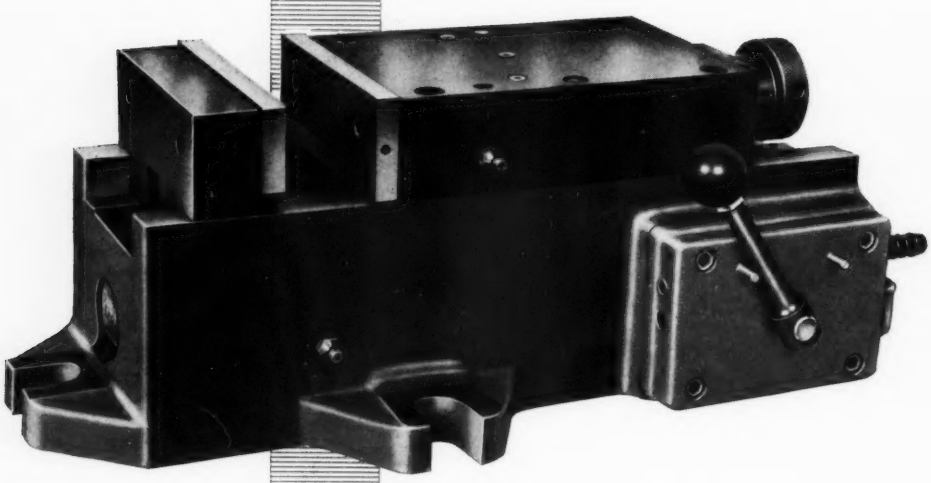

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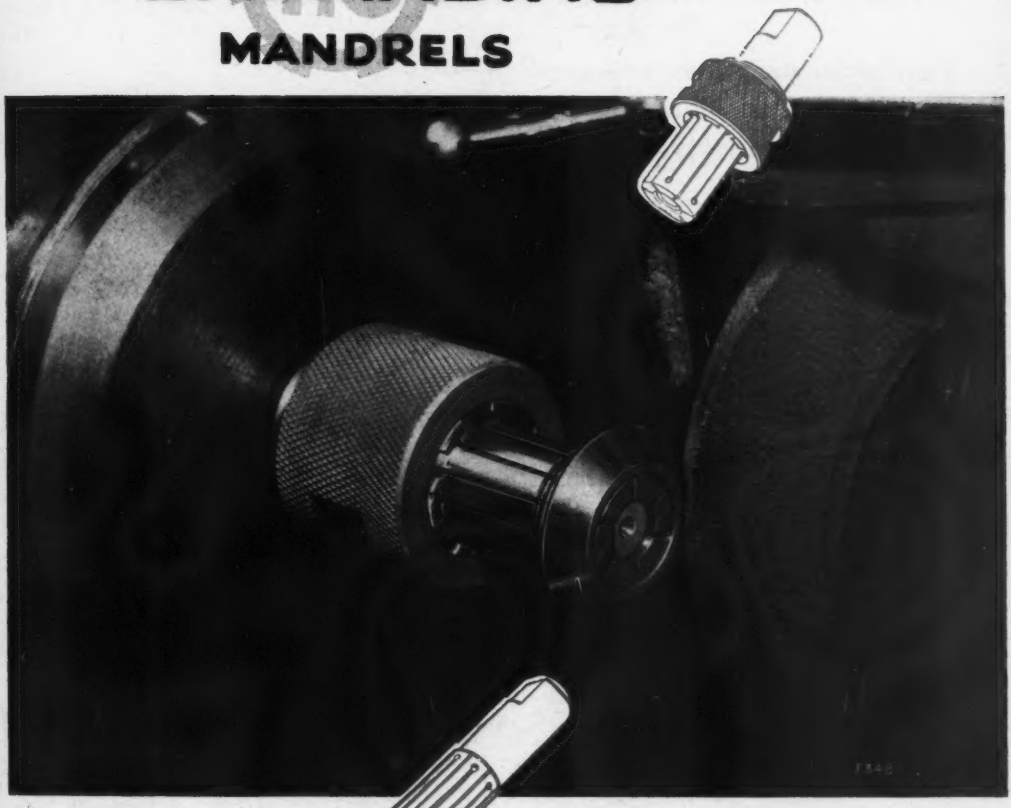

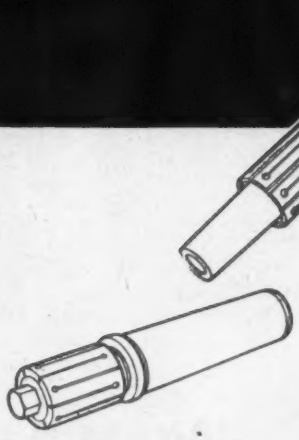

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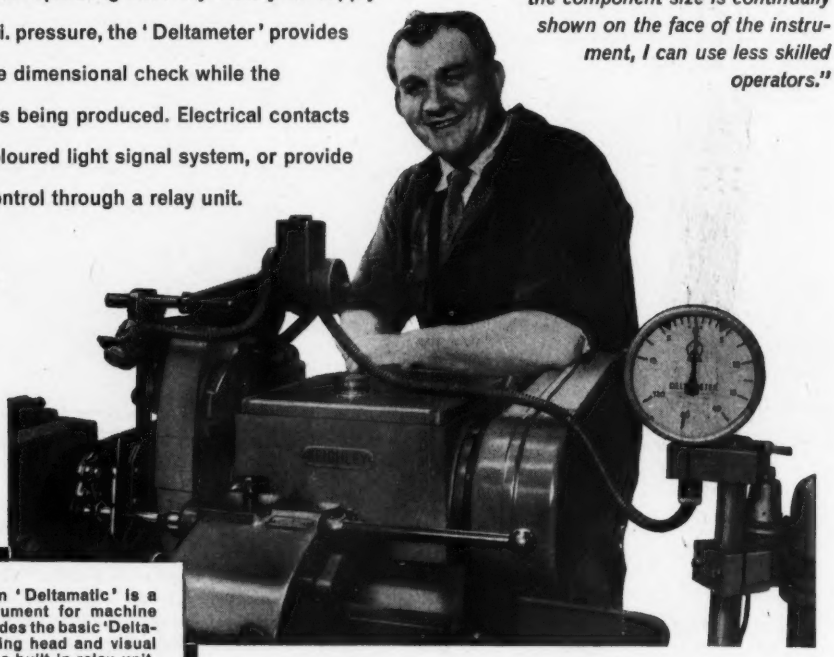

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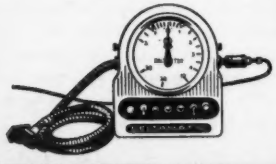

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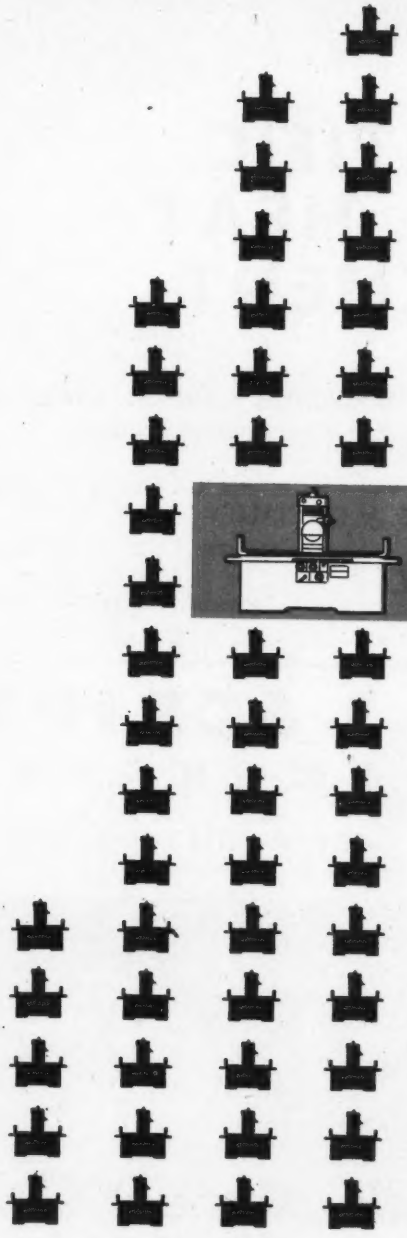

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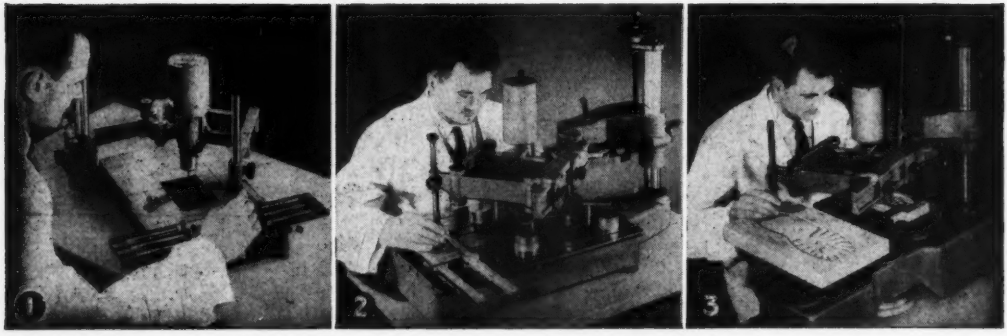

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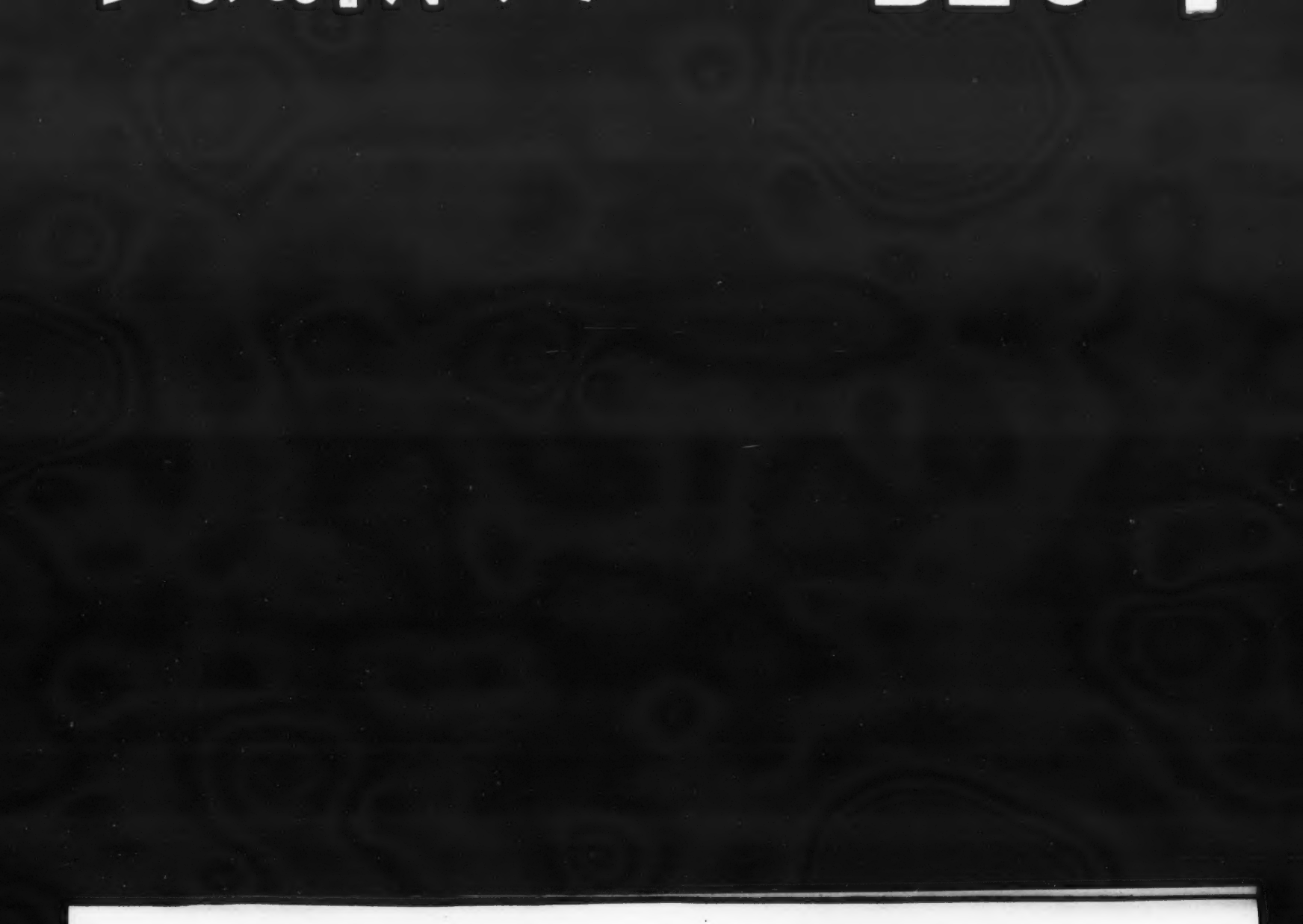

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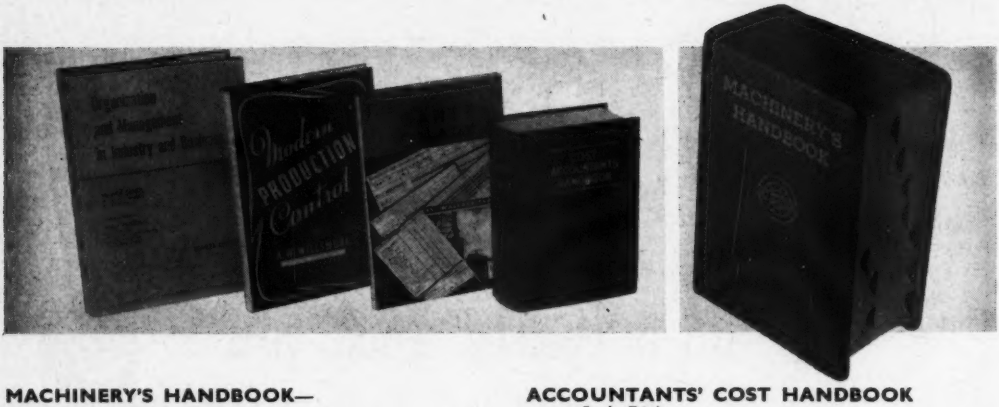

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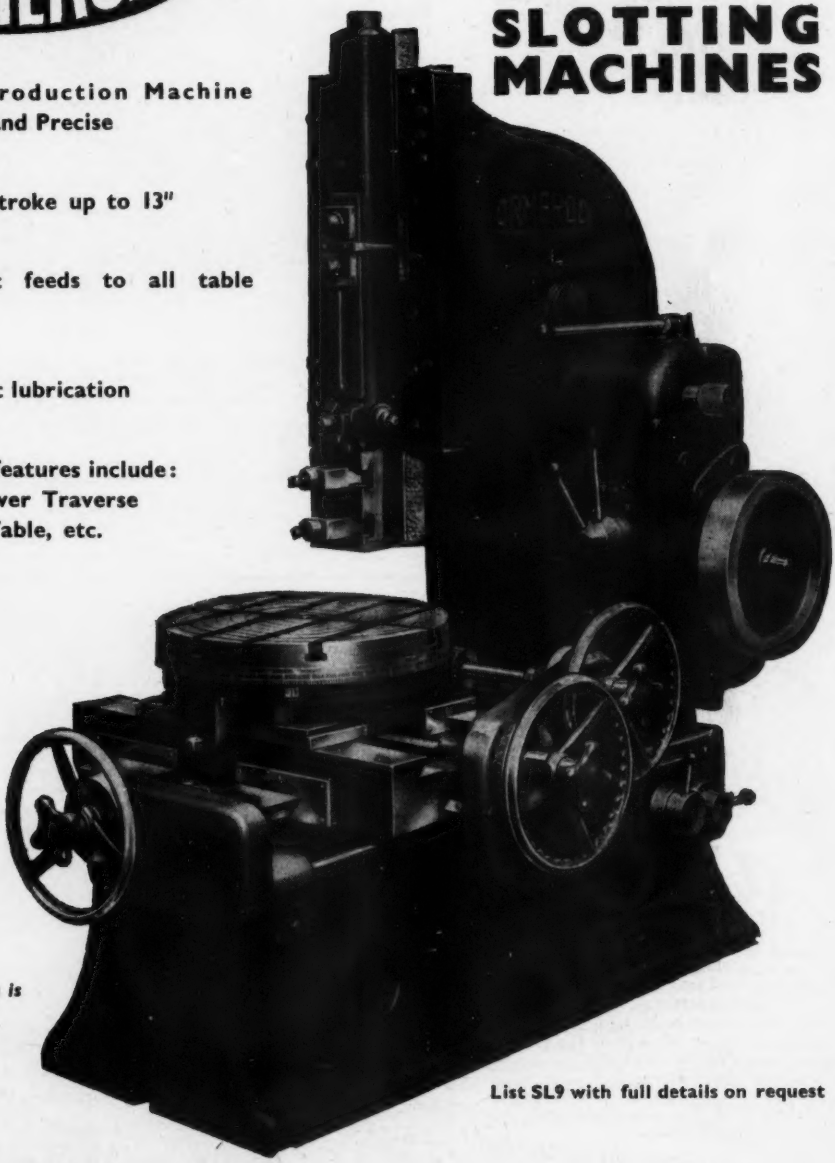

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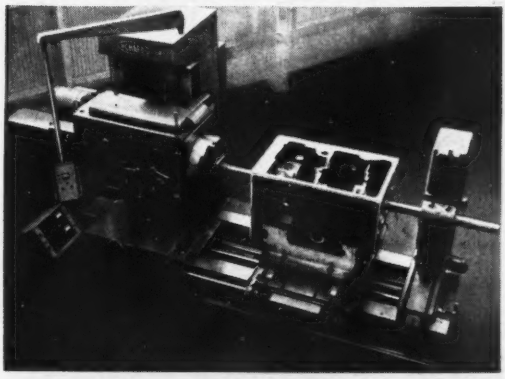

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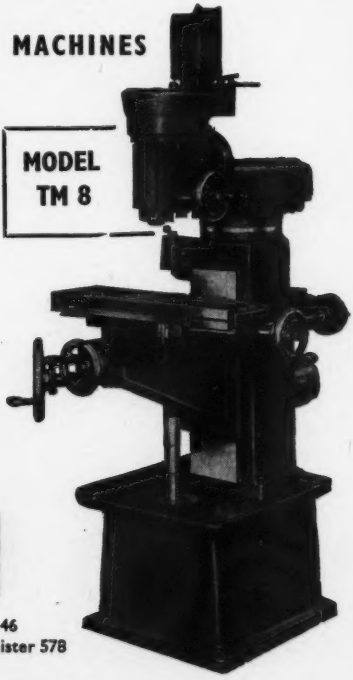

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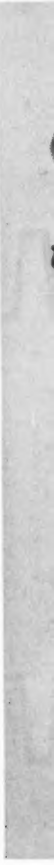

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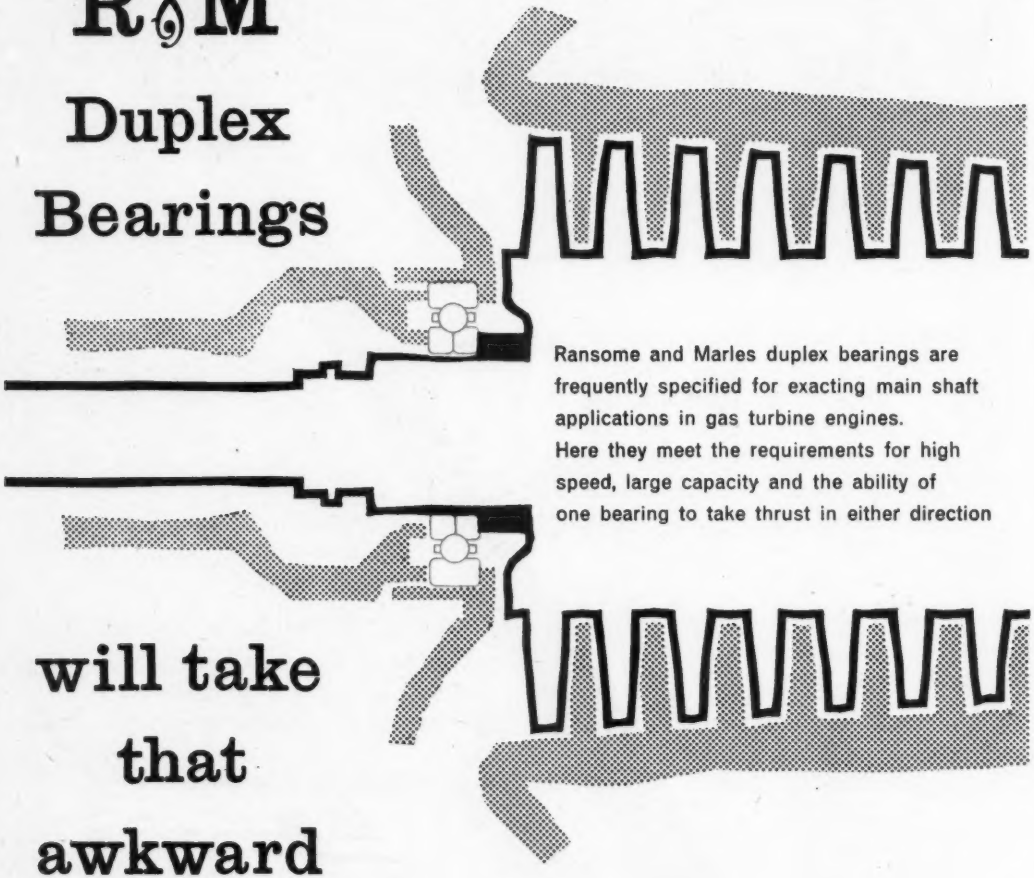

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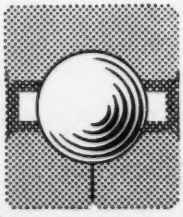

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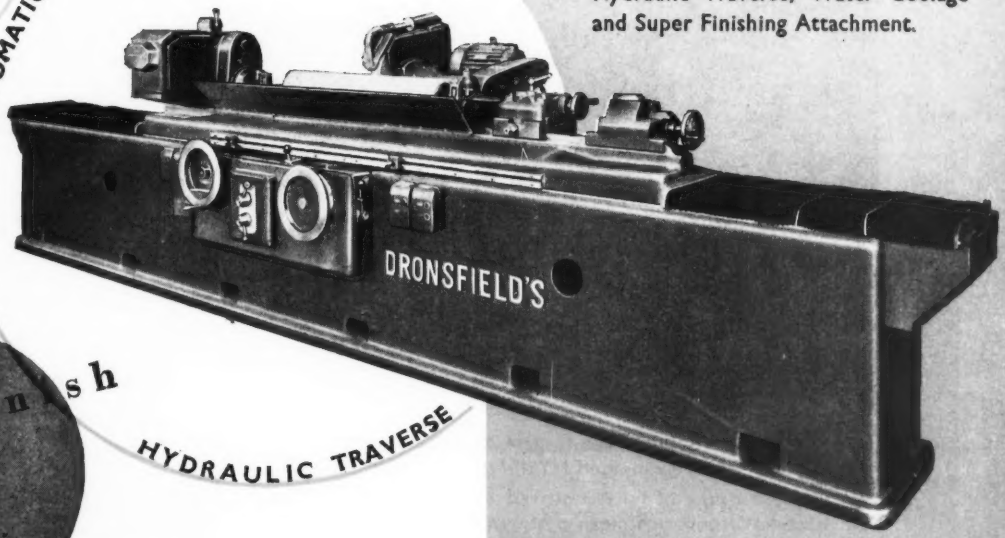

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Mechanized Metal-Finishing Operations P. 1452

In this second article, describing mechanized polishing techniques employed at Morphy-Richards, Ltd., St. Mary Cray, Kent, equipment for the automatic polishing of electric-iron cowls and bread-toaster bodies is discussed. Each of the machines for the electric-iron cowls comprises a modified Canning irregular-shape polishing attachment and head, on which provision is made for the automatic metered application of solid dressing composition to the mop. Four such machines are tended by one operator. In the firm's latest type of bread-toaster, which is designed to suit the polishing process, the body is nickel plated, texture-patterned, polished in three stages, chromium plated, and again polished, "in the flat," before it is finally bent to shape. Features of the four-station polishing machine developed for this work include automatic clamping, semi-automatic remote control of polishing pressure and drag, and automatic liquid-spray mop dressing. (MACHINERY, 98—28/6/61.)

Making Components for Type Casting and Composing Machines .. P. 1466

Type casting machines built by the Monotype Corporation, Ltd., Salfords, Redhill, Surrey, incorporate nozzles, made from stainless or En.1A steel, for the injection of the molten type metal into the die. The company has developed a semi-automatic drilling machine for nozzles, whereby a hole of 0·128 in. diameter by 2$\frac{1}{16}$ in. deep is produced in ten stages. After the work has been clamped pneumatically, the work-carrying slide performs the required sequence of rapid advance, feed and withdrawal motions, under air power with hydraulic feed-rate control. Provision is made for changing from the rapid advance to the feed rate when the bottom of the previously drilled hole is within 0·030 in. of the drill. A magazine-fed press tool has been built for sizing matrix blanks for the Super caster and Type & Rule machine. Blanks are advanced, one at a time, by a feed slide which incorporates plungers and an auxiliary slide for gripping the blank. A carbide sizing die has so far been used for 2$\frac{1}{4}$-million blanks without signs of wear. (MACHINERY, 98—28/6/61.)

Czechoslovakian Machine Tools at the Leipzig Fair .. .. .. P. 1477

A large jig boring machine, fitted with optical linear positioning equipment which is claimed to enable settings to be repeated within 0·0002 in., was shown in the Czechoslovakian pavilion at this year's Leipzig Fair. Of the cross-rail type, the machine has a side and a vertical spindle head, both arranged for milling operations. Hydraulic counterbalancing is applied to the cross-rail during its movements. The spindle heads are equipped for single-point tool thread-cutting operations under lead-screw control. A vertical lathe or boring mill, for operations on heavy flanged components, is fitted with two hydraulic copying slides in addition to a plunge-forming or recessing slide. Programme control is provided by electrical plug panels, and stop drums which are connected to the slides by cables. Punched tape, in the form of 35-mm. motion picture film, is employed on a range of milling machines for programme control of the table movements, also of spindle speeds and feed rates. A single-spindle, camless automatic, was shown, fitted with automatic loading and unloading equipment, and a range of heavy duty turret lathes, which can be arranged for automatic selection of spindle speeds, was also demonstrated. (MACHINERY, 98—28/6/61.)

Works of Hills Precision Die Castings, Ltd. P. 1485

This article describes the new layout of the factory of Hills Precision Die Castings, Ltd., made possible by the erection of an extension. The zinc and aluminium foundries are arranged at one side of the building, and the machine, polishing, plating, and assembly shops are laid out for efficient work flow. For certain castings, vacuum deposition of aluminium is employed as an economical and effective finishing process. In the foundries, each die casting machine is arranged for operation in conjunction with a water-quench tank and a trimming press. Castings from the press fall through on to a conveyor belt on which they travel past various machines designed for fettling, broaching, drilling and tapping operations, so that they leave the foundry in semi-finished or finished condition. For purposes of production control, records are maintained of the settings for each die which are found to give optimum results, and a quality control system enables trends to be detected before quantities of faulty parts are made. (MACHINERY, 98—28/6/61.)

IN FORTHCOMING ISSUES

The production of the SIMCA Aronde—Milling operations on oil-pump shafts—Some examples of methods employed for the economical production of bulk-handling equipment—Hungarian machine tools at the Leipzig Fair.

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EDITORIAL

Wear Resistant Surfaces for the Bores of Die Cast Aluminium Engine Cylinders

Attention has previously been drawn in MACHINERY to some of the advantages that may be gained, from the standpoints of both performance and production, by the adoption of pressure die cast aluminium cylinders for internal combustion engines of various types. Sufficient experience has already been acquired in this field to suggest that engines incorporating such cylinders are likely to be employed on a rapidly increasing scale, particularly in the motor car industry, with far-reaching effects on manufacturing procedures.

One obvious disadvantage of the aluminium alloys which have been mainly employed hitherto for die cast cylinders is that they are not sufficiently wear resistant to withstand the effects of piston and piston ring reciprocation in service. It has therefore been necessary, in general, either to employ a composite construction whereby a liner of a different metal—usually cast iron—is provided, or to apply some treatment to the aluminium to ensure the required degree of abrasion resistance. Investigations are, however, being carried out with various aluminium alloys of special composition, some of which, it is understood, contain as much as 25 per cent of silicon. It is possible, therefore, that the problem will ultimately be solved by the development of an alloy that will give generally satisfactory results without any surface protection, perhaps in conjunction with aluminium pistons coated with molybdenum, chromium, or some other metal.

If an aluminium cylinder is to be provided with an iron liner, the latter may be incorporated as an insert at the casting stage or may subsequently be pressed into position in the machined bore. The former method is now usually favoured, but whichever arrangement is adopted it is important that intimate contact should be maintained between the cylinder and the liner over the whole area and under all operating conditions. In the absence of such contact, full advantage cannot be taken of the good heat conducting characteristics of the aluminium and local overheating will occur. One combination, which is stated to have given very satisfactory results in practice, was discussed by Dr. A. F. Bauer in a paper presented at a recent meeting of the Society of Automotive Engineers. The centrifugally cast iron liners employed as inserts have rough external surfaces with fine undercut crevices into which the molten aluminium is forced when the cylinder is cast under high pressure. Tests have shown that the interlocking which occurs ensures a very secure bond, but it is emphasized that the required conditions cannot be achieved with sand or gravity die casting because the pressure is insufficient to ensure the necessary penetration.

Protective treatments which are successfully applied to the bores of aluminium cylinders include chromium plating and metal spraying by a special technique. Although satisfactory results can thus be obtained, the cost of such treatments may be comparatively high, and they appear to have been employed mainly for engines where weight considerations or dimensional limitations have precluded the use of cast iron liners.

An interesting new approach to the problem of providing cylinders in which wear resistance is combined with the other merits of aluminium alloy was described in Dr. Bauer's paper. Known as the transplant coat process, it represents, in effect a modification of the separate cast-in liner method. Instead of employing a centrifugally cast iron sleeve, a coating of metal of suitable thickness is sprayed on the surface of the core which will form the cylinder bore. Like the iron liner, this coating has a rough external surface, and a very satisfactory mechanical bond is thus obtained when the molten aluminium is forced into contact with it under pressure. In consequence, the coating adheres strongly to the bore of the cylinder and is stripped cleanly from the core when the casting is ejected from the die.

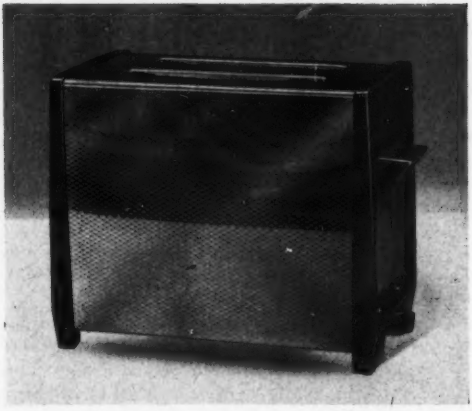
The bore of the coating applied in this manner, it is claimed, is smooth, accurate, and free from taper, and can normally be finished to the required standard by a honing operation only. This result it may be pointed out is in contrast to that obtained when a metal coating is sprayed on to the walls of the bore after the cylinder has been cast. The nature of the exterior of the coating is then determined by the machined finish of the bore to which it is applied and the interior surface has the roughness characteristic of this method of deposition. Whereas the transplant coat process provides a smooth bore, however, any reasonable degree of surface porosity can be ensured by suitable control

(*Continued on page* 1501)

Mechanized Metal-finishing Operations

Some Examples of the Methods Employed by Morphy-Richards, Ltd.

By S. C. POULSEN, Associate Editor



IN AN EARLIER ARTICLE, in MACHINERY, 98/1220—31/5/61, attention was drawn to some of the increases in productive efficiency that have been achieved at the works of Morphy-Richards, Ltd., St. Mary Cray, Kent, by the introduction of mechanized polishing techniques, and typical set-ups in the aluminium section, for polishing sole-plates for domestic electric irons, were described. Here, some further examples, concerned with the polishing of steel components, are considered.

POLISHING COWLS

Boat-shaped pressings for electric-iron cowls are polished, prior to nickel and chromium plating, in three stages, for the first and second of which, machines of the design shown in Fig. 1 are employed. Each group of four machines is tended by one operator, and they are arranged in pairs, as shown, about a comparatively small central floor-area, so that the time spent in moving from one to another is kept to a minimum. One machine of each pair is employed for the first polishing stage, and the other, for the second. This arrangement has been adopted in preference to the use of a larger, special-purpose, multi-station machine, since it affords greater flexibility, and enables components of more than one design to be processed simultaneously. Change-over, from one design to another, can be effected in 5 min. per machine.

A close-up view of the working zone of one of the machines, showing the polishing head and the method of supporting the work, is given in Fig. 2. Each machine incorporates a Canning universally-adjustable polishing head, with a 7½-h.p. driving

Fig. 1. Machines of the design here shown are employed for polishing electric-iron cowls, in two stages, prior to nickel and chromium plating. Four such machines are tended by one operator

Fig. 2. In this close-up view of one of the cowl polishing machines may be seen details of the fixture design, and the arrangement of the head. Solid dressing composition is applied automatically

motor, and a modified Canning irregular-shape polishing attachment, details of which are shown in Fig. 3. With the standard attachment, two rubber rollers are arranged to project vertically from the surface of the table. One of these rollers is rotated continuously, to serve as a driver, and the other can turn idly. The rollers can be moved through an arcuate path, by means of the lever *A*. When they are advanced towards the mop, the centre-distance between them is reduced, and when they are moved in the opposite direction it is increased.

These rollers are intended for use in conjunction with a fixture that incorporates a driving and guiding rail on the under-side. The rail is of an outline which corresponds to that of the work, and is straddled by the rollers. When the latter are swung towards the mop, the rail is gripped between them, and driven. The fixture is thus caused to rotate, and as it turns, is moved towards and away from the mop, with which the work—mounted on top of the fixture—is thus kept constantly in contact. When the rollers are swung in the opposite direction, the fixture is withdrawn slightly, and the separation of the rollers releases the rail.

On the attachments used by Morphy-Richards, Ltd., the rollers have been modified to provide a positive drive, as seen in Fig. 3, by the substitution of a chain-sprocket *B*, and two ball-bearings *C*, for the original rubber coverings of the driver and idler, respectively. The under-side of one of the fixtures used for polishing the cowls is also seen in Fig. 3, and it will be observed that the drive-rail *D* is of a lenticular outline, corresponding to the plan-form radii

Fig. 3. A view of the cowl polishing machine, with the fixture disengaged, showing details of the modified driving rollers *B* and *C*, and the roller-chain *E* incorporated in the drive-rail of the cast-aluminium fixture

of the work. When the fixture is in the working position, the sprocket *B* engages a duplex roller-chain *E*, mounted in a recess in the inner face of the rail, and is kept in mesh by the pressure of the idler against the outer face.

The main body of the fixture, including the drive-rail, is of cast aluminium, and the lower portion is enclosed by the sheet steel band *F*, which serves as a guard. To minimize friction and wear, the four steel supports *G* are fitted with small circular pads of P.T.F.E., which rest on the surface of the table, as seen in Fig. 2. This illustration also shows the arrangements for mounting and aligning the interchangeable work-locating elements, for cowls of different designs. The elements are also of cast aluminium, and each comprises a contoured block, which fits the interior of the work and has an integral flat base. Alignment is obtained by means of the four screws *H*, which pass through steel blocks attached to the top of the main body, to bear against the edges of the base, and the latter is secured by bolts that pass through oversize holes. Since the tables of the attachments tend to wear rapidly, and require frequent replacement, they are made from marine plywood, with an ⅛-in. steel facing. This construction is appreciably cheaper than the use of solid steel plate.

The profiled mops employed on these machines are built-up from 12-in. diameter stitched linen discs, approximately ½ in. wide, which are cemented together with Canning's Coldax adhesive, to give the required overall face-width. Profiling, to the required radius form, is carried out on a simple type of special-purpose machine, with a carbide tool which is swung about a pivot by means of a hand-lever. Subsequently, the face is dressed with Canning's Nupol sizing cement, and Nupol abrasive. The latter, it may be noted, is an artificial abrasive that does not readily fracture in use, and has been found superior to natural emery for such applications. Grades 1 and 2 are used for the first and second polishing stages, respectively, and the mops are run at a surface-speed of 6,300 ft. per min.

AUTOMATIC MOP-DRESSING

As indicated in the preceding article, the various mechanized polishing set-ups employed by the company incorporate arrangements for the automatic metered application of polishing compound to the mops. On the machines here considered, tallow is used for the first stage, and Canning's Carbrax compound for the second. These materials are supplied in the customary bar form, and each is fed to the mop in timed and controlled increments, by means of an Autocompo attachment (Howard Wall, Ltd., 25-37, Hackney Road, London, E.2.) as seen at *J* in Fig. 2. With these attachments, which are electrically operated, the feed increments are steplessly variable from zero to 0·020 in., per electrical initiating impulse. These impulses are delivered automatically, at predetermined intervals, under the control of adjustable timers, mounted on a centralized panel on the shop wall, near the machines.

The attachments operate on the roll-feed principle, and are provided with serrated rollers. To ensure that the rollers do not sink into the tallow and fail to grip, this material is supplied in a special pack. A strip of cardboard is passed round two sides and one end of the bar, and secured with Sellotape, and the bar is loaded into the attachment with the cardboard still in position, and with the open end towards the mop. The cardboard then ensures that the rollers grip firmly, and serves as a strap which applies a thrust against the rear end of the bar.

As the latter is consumed, the ends of cardboard are curled back by the edges of the aperture in the guard, so that they are kept clear of the mop. This method of packaging, it may be noted, also helps to avoid breakage of the bar during transport and handling.

Having unloaded and reloaded one machine, the operator proceeds to the next, and on each machine, a typical polishing contact-time per component is 0·17 min. To facilitate loading and unloading, each polishing head is provided with a pneumatic cylinder and an associated lever-operated control-valve, whereby the mop can be advanced to, and withdrawn from, the work. The stroke is adjustable, up to a maximum of 4 in. When the mop is advanced to the working position, it is held against the work by the pressure of a compression spring, with a "float" of $\frac{3}{16}$ in. This arrangement ensures that the mop "wraps" round the corners of the work, so that they—as well as the main side surfaces—are fully polished, and that mop wear is taken-up automatically. The pressure applied is adjustable, and if required, the mechanism can be locked, to hold the mop rigidly.

For the third polishing stage, at which each component is finished on the rear end, nose, and top radii, hand methods are employed, since these portions cannot readily be processed on the machines described. The felt mops used are dressed with Adamastic cement (Alfred Adams, Ltd., Church Lane, West Bromwich) and grade 220 natural emery, and are lightly lubricated with tallów. Hand methods are also employed for any further polishing that may be required, after nickel and chromium plating.

FINISHING BREAD-TOASTER BODIES

As indicated in the preceding article, with the introduction of mechanized polishing, the company has adopted the policy of adapting products, where possible, to suit the polishing process, and a typical example of the application of this policy is in connection with the electric bread-toaster, shown in the heading illustration. The main body of the toaster, which is of 22-s.w.g., texture-patterned nickel- and chromium-plated mild steel, is so designed that patterning, plating and polishing can be carried out "in the flat," before the two bends are formed. On the main production line, the high-quality roll-finish strip is cut into the required lengths, the ends are pierced and flanged, and the bread-slots are blanked and plunged. The work is then delivered to the plating shop, where, without any other preparation than degreasing, it is nickel plated. To ensure that the deposited coatings have adequate strength and adhesion to withstand subsequent bending, both nickel and chromium plating are carried out under carefully-controlled conditions, as will be described.

Fig. 4. General view of the 4-station automatic polishing machine for toaster-bodies, showing the principal features of the installation. The overall polishing capacity is 750 sq. ft. per hour

After the work has been nickel plated, the textured diamond-pattern is produced on those portions which will form the sides of the bodies.

Following this stage, the work is transferred to the polishing section. Here, each piece is polished, in three stages, on the multi-station machine shown in Fig. 4, and it is then chromium plated. After this second plating process, it is again polished on the same machine, in a single stage. Since polishing is carried out after the work has been patterned, and the texture is fine and shallow, accurate control of the process is necessary, to ensure that the pattern is not obliterated. To this end, the machine incorporates several refinements, and is one of the latest and most advanced to be installed by the company. Of these refinements, one of the most important is the provision for semi-automatic remote control of polishing pressure and drag, on a power consumption basis.

The general layout of the machine is shown diagrammatically in Fig. 5, and the direction in which it is viewed in Fig. 4 is indicated by the arrow *P*. It comprises a standard, return-circuit, conveyor-type base unit *Q*, of American design (Hammond Machinery Builders, Inc., licencees, B. O. Morris, Ltd.), and four Morris polishing heads, *R*, *S*, *T* and *U*. A series of tables, equipped with fixtures designed by Morphy-Richards, Ltd., is driven by endless chain, and the fixtures are loaded and unloaded continuously. Here again, the layout has been arranged for flexibility, so that the equipment can be used for polishing either nickel- or chromium-plated parts only, at any given time, or both nickel and chromium simultaneously. The latter system, for which three operators are required, will now be considered in some detail.

THE WORKING CYCLE

Nickel-plated components are loaded into the fixtures by the operator at *V*, and are carried beneath the polishing heads *R*, *S* and *T*, which provide for the first, second and third stages, respectively. The operator at *W* is responsible for

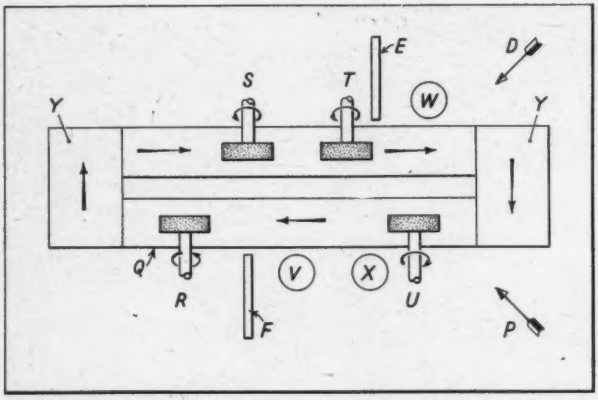


Fig. 5. Diagrammatic layout of the toaster-body polishing machine, showing the arrangement of the various heads, the direction of work movement, and the three operator stations

unloading the polished nickel-plated components, and reloading the fixtures with chromium-plated components, which are polished by the head *U*, and unloaded by the third operator at *X*. On this machine, the conveyor-system is of the so-called "in-line return" type. At the ends of the two parallel working sections, within the enclosed areas *Y*, each table, in turn, is transferred sideways from one section to the other. This "square" motion ensures that the orientation of the work remains the same in both sections. Consequently, the end-for-end direction in which the work passes beneath the head *R* is the reverse of that at *S* and *T*. On the head *R*, the direction of mop rotation is arranged to oppose the forward motion of the work, whereas at *S*, *T* and *U*, rotation is in the direction of work motion.

FIXTURE DESIGN

A typical fixture, viewed from the operator's station at *V*, is shown in Fig. 6, in which the arrangements for automatic clamping may be observed. The main body of the fixture has a flat surface, with two recesses *Z*, to provide the necessary clearance for the bread-slot flanges. In the centre of each recess, there is a block over which the bread-slot flanges fit. This block is of the same height as the platform, and has radiused upper corners. The blocks serve to control the mop action, so that, although it is not concentrated excessively on the bend-radii surrounding the bread-slot apertures, it is, nevertheless, sufficient to ensure that these areas are adequately polished.

When the fixture is loaded, and the work is smoothed down flat, the inner faces of the end-flanges are engaged by the ends of the flat top portion. As the fixture is carried clear of the loading station, each of the roller-ended plungers *A*, in turn, is engaged by the stationary cam *B*, with the result that it is thrust laterally through the body of the fixture, and protrudes by a corresponding amount on the opposite side. This displacement closes each of the clamping-jaws *C*, through the action of an associated wedge, and the flanges of the work are gripped against the ends of the platform. As the jaws close, conical pins in the work-

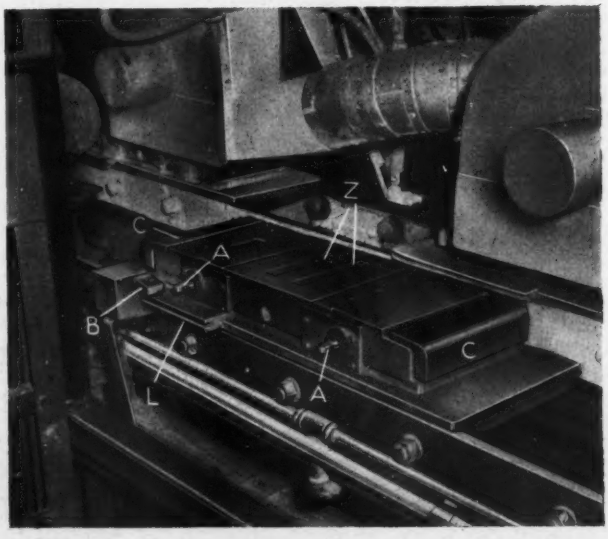


Fig. 6. In this close-up view may be seen details of the fixture design, and the arrangements for the automatic actuation of the clamping-jaws *C*, by the plungers *A*, and stationary cams *B*

Fig. 7. View in direction of the arrow *D*, Fig. 5, showing the two panels for the semi-automatic remote control of polishing drag and pressure

ing faces enter the holes in the flanges, to locate the work positively. Conversely, when the work has been polished, and the fixture approaches an unloading station, a corresponding cam, mounted on the opposite side of the conveyor-track, thrusts the plungers in the reverse direction, thereby serving to withdraw the jaws.

POLISHING HEADS

Each polishing head, which is driven by a 10-h.p. motor, carries a 16-in. diameter ventilated mop, of bias-cut calico, with a face-width of 9 in. These mops, which are supplied by John Hawley & Co. (Walsall), Ltd., Goodall Works, Bloxwich Road, Walsall, Staffs., are run at a surface-speed of 5,800 ft. per min., and the work is traversed beneath them at 12 ft. per min., while the mops are reciprocated axially, through a stroke of ½ in., at 40 strokes per min. Each head has a spring-loaded "float" of ½ in., to enable the mop to rise slightly as the sloping face of the leading clamping jaw (see Fig. 6) passes beneath it, and to maintain uniform contact-pressure over the surface of the work. To minimize vibration, each mop, when new, is carefully trued before it is put into service.

As already indicated, provision is made for the semi-automatic remote control of the polishing pressure and drag. This control is effected independently for each head, from the two control-panels seen in Fig. 7, where the machine is viewed in the direction of the arrow *D*, Fig. 5. The panel at the right (*E*, Fig. 5) provides for the control of three of the polishing heads, and that at the left (*F*, Fig. 5) for the fourth head. This second panel also carries the four main "on-off" switches for the mop driving motors. On the panel at the right, there are three 3-position switches *G*, and a fourth, similar switch is mounted on the second panel.

Each of these switches controls the direction of rotation of an auxiliary motor and feed-screw on each head, whereby the latter is raised or lowered. These auxiliary motors may be seen at *H*, Fig. 4 and 7. Immediately above each of the switches, there is an ammeter that indicates the current taken by the main drive-motor, and consequently the amount of energy being expended in mop friction. By means of the switches *G*, the heads are set to such a height that the ammeter-readings are of a predetermined value, established by experience, which corresponds to optimum polishing drag. In addition to facilitating the maintenance of standardized polishing conditions, this system provides much useful information concerning mop wear, and the rate at which dressing composition is applied to the mops, since the influence of these factors is immediately indicated from the ammeter-readings. Responsibility for observing the instruments, and carrying out any necessary adjustments to the settings, is shared by the operators at *V* and *W* in Fig. 5.

LIQUID SPRAY DRESSING

The timed and metered application of liquid dressing composition to the mops is effected by means of spray-guns of the Paasche type (W. Canning & Co., Ltd.) and one of these guns, on the head *U*, Fig. 5, is seen in Fig. 8. As may be observed, the gun *J* is exceptionally compact, and is mounted on a slide which is reciprocated by the double-acting air-cylinder *K*. The trips and revers-

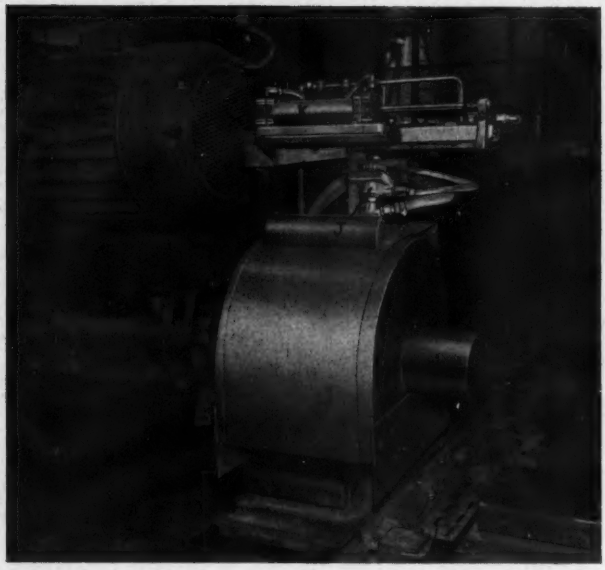


Fig. 8. Typical head, showing the air-cylinder for reciprocating the spray-gun *J*, whereby a metered quantity of liquid dressing composition is automatically delivered to the mop, for each successive component

ing-valves associated with the air-cylinder provide for full adjustment of the rate of reciprocation, with independent control of the speed in each direction. As on other machines equipped for liquid spray dressing, the gun is mounted in such a way that it can be adjusted radially and angularly, in relation to the wheel. The correct peripheral distance and impingement-angle can thus be maintained as the mop wears.

Each spray-gun is arranged to start delivery of composition immediately before the component passes beneath the mop, and to cut-off at approximately two-thirds of the total travel. For this purpose, each fixture is provided with a rail-cam, as at *L* in Fig. 6, and these cams actuate valves, mounted at the side of the conveyor-track, which control the spray-guns. Liquid composition is fed to the guns from Bullows paint spray pots (*M*, Fig. 4), two of which serve the three nickel polishing heads, and a third, the chromium polishing head. All compositions used on this machine are supplied by Lea Manufacturing Co. of England, Ltd., P.O. Box 1, Buxton, Derbyshire. At the first two nickel stations, "green finish" No. 7707A is employed. The same medium is also supplied to the third nickel station, but in this instance, a small proportion of Vienna lime is metered on to the work, independently, just before it passes beneath the mop, for "liming-off" or "colouring." White finish, No. TH53P, is used at the chromium polishing station.

All composition feed-lines, it may be noted, incorporate "tee" connections to a warm-water supply. This arrangement provides for periodically flushing-out the lines, when the machine is not in use, to prevent hardening of composition on the walls. The same system is used for cleaning the mops, which are sprayed with warm water through the guns, to prevent the formation of hard deposits on the working faces. In addition to scratching the work, such deposits tend to cause vibration, due to dynamic unbalance.

MOP-COWL DESIGN

On all the polishing machines used by the company, the mops are enclosed by air-extration cowls. The design of the cowls used in connection with liquid spray dressing installations required careful study, directed to minimizing the effects of the barrier of rapidly-circulating air, created within the cowl by the rotation of the mop. A side view of a mop-cowl on the toaster-body polishing machine, showing the principal features of the design, is given in Fig. 9. To minimize circumferential flow, a transverse baffle is mounted internally, immediately upstream of the slot through which the spray is delivered. This baffle also serves to establish a region of low pressure at the slot, through which external air is drawn, to stabilize the spray. To reduce turbulence, and consequent breakdown and scattering of the spray, the slot is surrounded externally by the intake *N*. On the upstream side of the baffle, there is a region of positive pressure. which assists the action of the air-extraction system.

To ensure that the spray is fully effective, it is essential to keep the cowl as close to the mop and work as possible. The cowl is therefore adjustable vertically, and provision is also made for adjusting the air-extraction connection *P*, to enable it to be aligned correctly with the stream of dust and moisture thrown off by the mop. From the machine described, the polished nickel- and chromium-plated components are both unloaded at the rate of one every 20 sec., corre-

sponding to an overall polishing capacity of 750 sq. ft. per hour.

PLATING PLANT

In view of the important relationship between machine polishing and plating quality, and the need for plated coatings that will satisfactorily withstand bending, reference will now be made to plating technique. A diagrammatic layout of the plating shop is given in Fig. 10. In the polishing shop, the components to be plated are degreased in the tank *R*, in transit containers, and placed on the belt conveyor *S*, which carries them to the inspection and plating-jig loading line *T*, in the plating shop. Here the unplated components are unloaded from the transit containers and mounted on the plating hangers. The now-empty transit containers are reloaded with chromium-plated components, and are returned to the polishing shop on the lower run of the conveyor *S*.

The line *T* is served by a Teleflex overhead conveyor circuit, to which hangers of plated components are transferred from the plating plant. Along the line, the plated components and plating jigs are removed from the hangers, the latter are reloaded, and are returned manually to the plating plant. The jigs, which are covered with Unichrome plastisol vinyl chloride protective coating, are of the firm's own design, and are supplied by Newton Plating Jigs and Insulations, Ltd., 13 Strafford Road, Acton, London, W.3. Typically, the work-surface area per hanger is maintained at 4 sq. ft.

Fig. 9. Side-view of mop cowl, showing some of the design features found essential for liquid spray dressing. These features include an internal baffle (not visible) to minimize circumferential air-flow

The Efco-Udylite plating plant is of the twin-track, fully-automatic transfer, return-circuit type, and has a capacity of 193 hangers an hour. All controls are centralized on the panel *U*. The

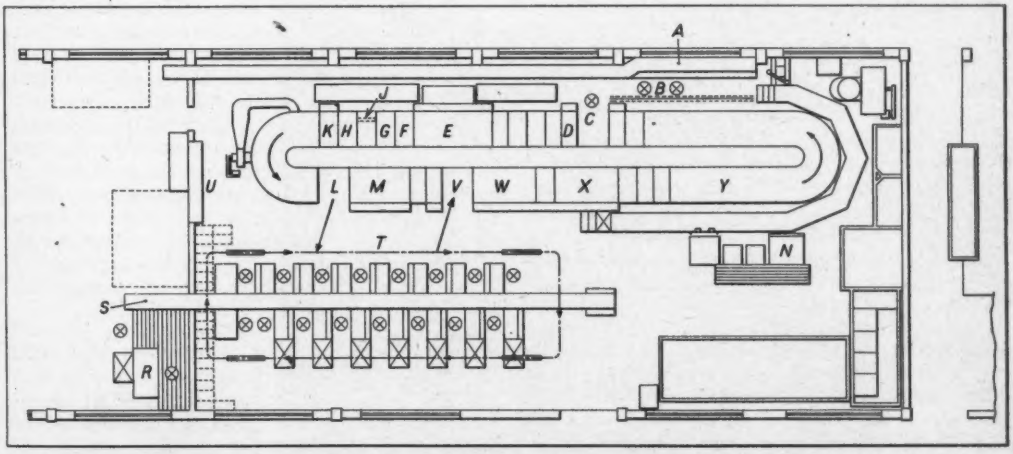


Fig. 10. Diagrammatic layout of the plating shop, showing the arrangement of the conveyors for transferring work from and to the polishing shop, and the automatic plating plant

intervals at which the transfer mechanism operates are adjustable, to provide for different processing schedules, to meet B.S. plating specifications. For any given interval-setting of the transfer mechanism, the duration of each particular processing stage is determined by the length of the bath in question. All surface-preparation, immediately prior to plating, is effected electrolytically, in solutions formulated by the company, which contain smut-inhibiting agents, where appropriate. The water in the various inter-stage rinsing baths is agitated, and immediately above each of these baths, there is a spray of clean cold water, through which the work is raised by the transfer gear.

Hangers of fresh components, for nickel plating, are loaded on to the transfer gear of the plating plant at the station *V*. In the first bath, at *W*, the work is cathodically cleaned, at a current density of 25 amp. per sq. ft., and a temperature of 160 deg. F. to 200 deg. F. After an intermediate warm rinse, it is anodically cleaned at a current density of 35 amp. per sq. ft., in the bath *X*, which contains solution identical to that used for the cathodic stage, and maintained at the same temperature. Anodic cleaning is followed by rinsing in cold water; acid dipping; cold rinsing; and nickel plating in the bath *Y*.

NICKEL PLATING

The nickel solution is basically Perflow (Harshaw Chemicals, Ltd., Eleanor Cross Road, Waltham Cross, Herts.) which is modified to obtain enhanced levelling properties, and a deposit of high ductility. Anodes of rolled, oval-section, depolarized nickel are employed, which are enclosed in Terylene bags. The solution is continuously circulated by two stainless steel centrifugal pumps (British La Bour Pump Co., Ltd., 109, Blundell Street, London, N.7) through four filter-units (British Filters, Ltd.). In these units, the filter elements are grade FCB Ford Sterimats (T. B. Ford, Ltd., Loudwater, High Wycombe, Bucks.) of compressed cellulose fibre material. A proportion of the electrolyte is bypassed through an electrolytic purification cell, served by an independent rectifier, for the removal of metallic impurities due to trace contaminants in the salts.

Before it is returned to the main plating bath, the filtered and purified solution is heated to a thermostatically-controlled temperature of 140 deg. F., by means of two Powell-Duffryn graphite-block heat-exchangers. (See MACHINERY, 96/640—23/3/60). These units are protected against overheating due to pump failure, and subsequent thermal shock, by a thermostat in the delivery line, which actuates an associated electrically-operated valve, to cut off the steam supply. The nickel, and all other solutions, are under constant laboratory control, and equipment for the automatic pH control of the nickel solution has been installed.

When the components reach the end of the nickel plating bath, they are rinsed in cold and then in hot water, and the hangers are transferred manually on to an overhead rail, at station *B*. Here, the components are unloaded on to the conveyor *A*, on which they are transferred to the polishing shop. Polished nickel components are returned to the plating shop on the upper section of the conveyor *S*, and are mounted on hangers in the jigging area *T*. The loaded hangers are then replaced on the transfer gear of the plating plant at station *C*, at the head of the chromium plating section.

Here, the work is first cathodically cleaned in an alkaline solution in the bath *D*, to overcome any passivity of the nickel deposit. This bath is kept at a temperature of 160 deg. F. to 200 deg. F., and the work is subsequently rinsed; acid dipped; again cold rinsed; warm rinsed; and chromium plated in the bath *E*. The chromium plating bath contains a low-density chromic/sulphuric acid solution, and fume-suppression is effected by the use of Efco Zeromist additive, so that the need for the customary fume-extraction equipment is avoided. As the work leaves the chromium plating section, it receives a drag-out rinse in the bath *F*, followed by a cold rinse; an alkaline neutralizing dip; another cold rinse; and a final hot rinse.

A feature of the two cold rinsing tanks *G* and *H* is that they are interconnected by the pipe *J*, which passes through the neutralizing tank. Fresh water flows into the tank *H*, and thence through the pipe to *G*, where is overflows to waste. Thus, carry-over of alkaline solution into bath *H* serves to neutralize acidity in bath *G*, carried-over from the drag-out rinse *F*. Waste heat, from the trichlorethylene degreasing bath *R*, in the polishing shop, is utilized to provide warm water for the final rinsing stage *K*, whence the work is passed through a steam-heated recirculating-air drying oven, to be finally unloaded at station *L*. Any chromium deposit found to be defective is stripped in the bath *M*, in preparation for re-processing, and for the corresponding operation on nickel, another bath is provided at *N*.

PRODUCTION OF PEDAL CYCLES in the U.K. during January and February of this year was 133,000 and 155,000 respectively. The corresponding numbers of bicycles exported were 96,000 and 110,000. The monthly average of bicycles produced in 1960 was 190,000 and exported, 126,000.

The A.E.I. Blading Factory at Larne

Some Further Examples of Machines and Set-ups for the Production of Turbine Blades

By A. W. ASTROP, Associate Editor

SET-UPS FOR PRODUCING TURBINE BLADES on a special-purpose Holroyd milling machine, a Heller horizontal copy-milling machine, and a Sundstrand plunge-milling machine, all installed at the A.E.I. blade factory at Larne, Northern Ireland, were discussed in an article in MACHINERY, 98/1402—21/6/61. Some further examples of practice at this factory are here considered, and attention is first drawn to the set-up shown in Fig. 1, on a Rockford hydraulically-operated openside copy-planing machine (Rockwell Machine Tool Co., Ltd.). On this machine, the convex surfaces of two stainless-iron turbine blades are copy-planed simultaneously, under the control of the Kopy-Kat attachment seen at the left.

It will be noted that the blades are machined transversely—that is, in the chord-wise direction—since the shoulder formed at one end by the root platform precludes planning longitudinally. The blades are held in a fixture, which is secured to the machine table, and incorporates the necessary arrangements for locating the blades and presenting them to the tool at the required angle. A form tool is employed, the cutting edge of which is in the approximate form of a letter B, laid on its side with the radii downwards. In fact, there is a concave-radius relief between the two convex radii, which are at the edges of the tool, and the form can be seen on the spare tool indicated at *A*.

The long edge opposite to the cutting surfaces is of enlarged section, and fits into a slot in the split-type tool-holder, wherein it is clamped by two screws. Twin master forms are employed, one of which is indicated at *B*, and they are clamped to a T-slotted plate which is supported by a welded-steel bracket secured to the left-hand edge of the machine table. The master forms are made from a plastics metal alloy, which is poured around a series of gauge-steel templates, the edges of which can be seen in the master form *B*. These templates are shaped on the upper edges to the required convexity, to suit the blade to be machined, and the upper surface of the soft alloy is hand-finished, using the templates as guides. The two master forms are bolted down at the same centre distance as the blades in the fixture, and the gap between them is bridged by a strip of hardwood. With this arrangement, the follower stylus is prevented from descending unnecessarily far

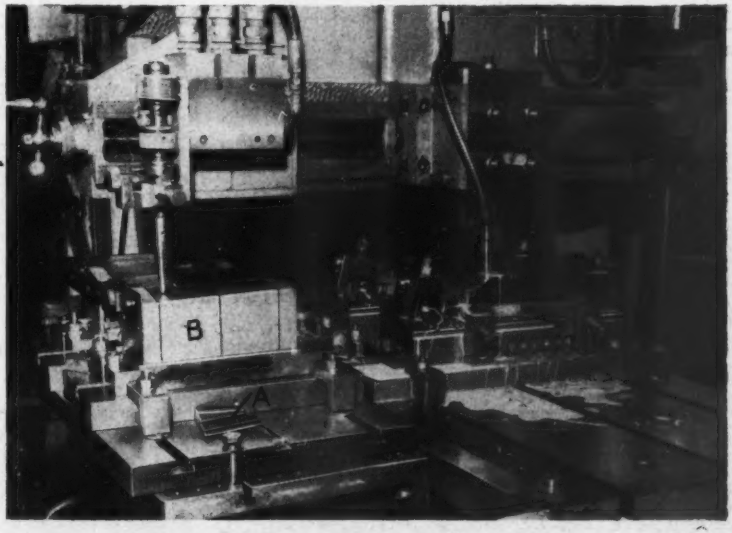


Fig. 1. Rockford open-side hydraulic planer set-up for copy-planing two blades in the chordwise direction under the control of the Kopy-Kat attachment and masters at the left

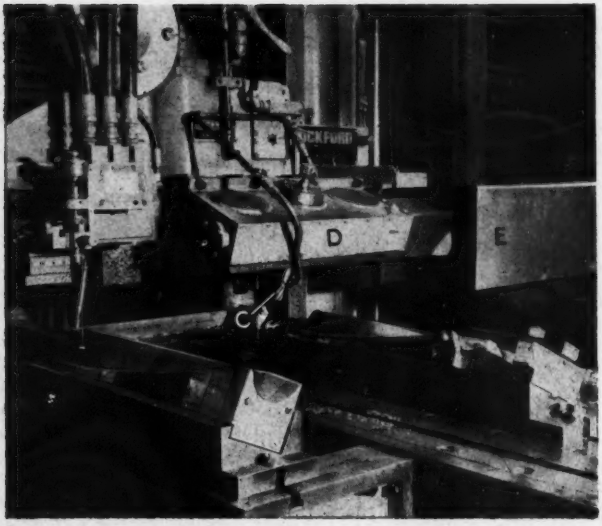


Fig. 2. This Rockford open-side planing machine has been modified by the company to provide for high-rate copy milling of blades in the longitudinal direction

when traversing the space between the masters.

The tool-box is mounted on a cast member which is arranged for vertical movement on a saddle on the main cross-rail of the machine. Vertical movement of this cast member is effected hydraulically, under the control of the Kopy-Kat unit, which is carried on a sub-slide, also mounted on the cross-rail. This sub-slide has horizontal ways, whereon the copying unit can be adjusted transversely, for setting purposes, and the cast member carrying the tool-box has a T-slotted surface, to allow the box to be adjusted horizontally, and clamped in the required position.

As the stylus leaves the former *B*, at the end of a cut, a dog on the table trips a switch which controls a valve in the hydraulic circuit for the vertical movement of the cast member carrying the tool-box. As a result, the tool is raised rapidly, and a time-delay mechanism is started. This delay can be set, in relation to the speed at which the table returns, to ensure that the tool is lowered slowly and reaches the cutting position just before the table is reversed.

ROCKFORD PLANER MODIFIED FOR HIGH-RATE MILLING

An interesting set-up is employed on another, similar Rockford open-side planing machine, which has been modified by the company for high-rate milling of the concave surfaces of turbine blades, in the longitudinal direction. A close-up view of this machine is given in Fig. 2, where a forged stainless-iron turbine blade can be seen in position in a fixture on the machine table. The master form, of plastics metal alloy, is supported on brackets secured to the side of the table, the arrangement being generally similar to that described for the machine shown in Fig. 1. Nine gauge steel templates are incorporated in the master, representing the required forms at various stations throughout the length of the blade, and it may be noted that the lead-in portion—farthest from the camera in Fig. 2—is of hard wood.

The machine is equipped with a Kopy-Kat hydraulic duplicating attachment, seen at the left, the follower of which has a plain cylindrical end and is arranged at an angle to the vertical. The diameter of the cylindrical portion, and the angle to which the follower is set, correspond with the size and angle of inclination of the milling cutter, which projects vertically downwards and is indicated at *C*.

FABRICATED-STEEL GEARBOX

The cutter is held in a spindle projecting from the under-side of the fabricated-steel gearbox *D*, bolted to the cross-rail of the machine in place of the conventional planing tool-box. The cutter is retained in the spindle by means of a draw-bolt, and it may be noted that provision is made for mounting two additional spindles, one at either side of that here shown. Large-diameter machined pads can be seen on the upper side of the gearbox, at the positions where the additional spindle mountings could be bored, and with this arrangement three turbine blades could be machined simultaneously, under the control of one master form.

Drive to the spindle is taken from a horizontal shaft within the gearbox, located just behind the long front wall, and the left-hand bearing for this shaft can be seen in the end wall of the gearbox nearer to the camera. The other end of the shaft extends from the right-hand end of the box and is driven, through a universally-jointed shaft beneath the cover *E*, by a 5-h.p. motor at the side of the machine. A worm on the shaft within the gear-

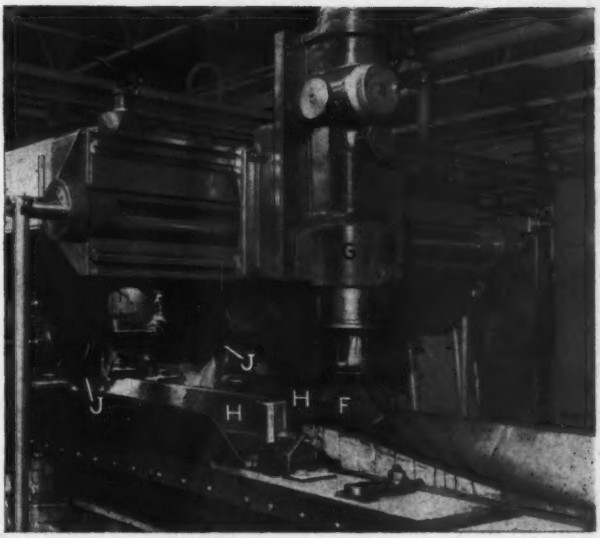


Fig. 3. Copy-milling of some types of blades is carried out in the transverse direction on Swiss Rigid milling machines, and a typical set-up is here shown

box meshes with a wormwheel on the cutter spindle, and drive to the additional spindles, if fitted, would be transmitted in the same manner.

For the blade shown in Fig. 2, a ⅝-in. diameter, high-speed steel end-milling cutter, supplied by Larcher Cutters, Ltd., Witton, Birmingham 6, is employed, and is driven at 550 r.p.m. This cutter has a small radius on the corners of the teeth, and as it is mounted at an angle to the vertical, it cuts on only a small portion of the periphery. The work is fed beneath the cutter at rates between 15 and 20 ft. per min., depending on the depth of cut, which varies from 0·030 to 0·040 in. For the blade here shown, a typical total stock removal of 0·100 to 0·150 in. is required, and it has been found that an average of 25 blades can be machined between regrinds.

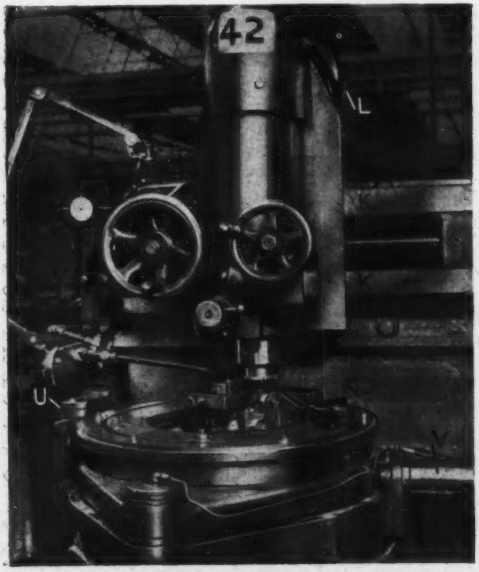


Fig. 4. This special machine provides for milling the rivet pip on the tip end of a blade

COPY-MILLING MACHINE

For certain other types of long turbine blades, Rigid horizontal milling machines (Dowding & Doll, Ltd.) are employed, and a typical set-up is shown in the close-up view Fig. 3. With this arrangement, twin side-and-face form cutters are used to take transverse passes on two blades at a time, under the control of the single master and follower seen in the foreground. Again, the master form is made from a plastics metal alloy, and is shaped to gauge steel templates, a number of which can be seen cast in position. The follower is mounted on a vertical stylus, of the deflecting type, which, in turn, is carried in a heavy cast bracket *G*, arranged for transverse movement on a cross-rail. Arranged parallel with the master, the two turbine blades are indicated at *H*, and the twin cutters—mounted on a common arbor—at *J*. Driven at 34 r.p.m., the latter are of 8 in. diameter by ⅝ in. wide, and the teeth are formed to a $\frac{1}{16}$ in. radius. They were supplied by Richard Lloyd, Ltd., Birmingham.

In operation, the work-table is fed transversely at an average rate of 4·6 in. per min., to complete a chord-wise pass over the two blades. At the end of this pass, the work-table is traversed longitudinally through a distance of 0·110 in., and a second transverse pass, in the opposite direction, is automatically started. This procedure continues,

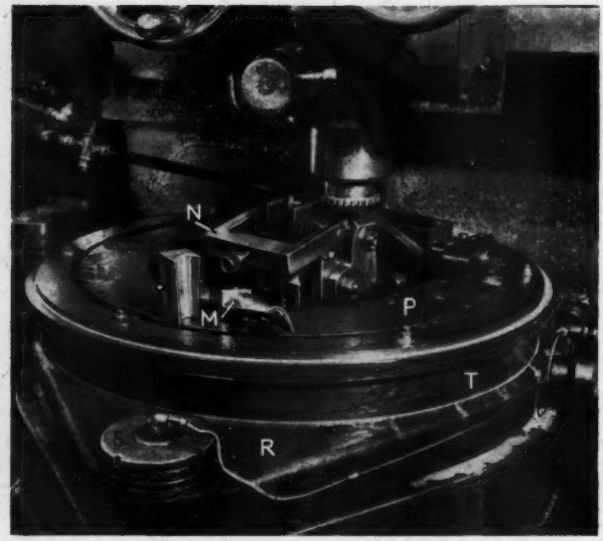


Fig. 5. Close-up view of the working area of the machine shown in Fig. 4. The work-table is arranged to pivot about the centre *S* under the control of the cam ring *T*

automatically, until the entire concave surfaces of the two blades have been machined.

SPECIAL PIP-MILLING MACHINE

Many of the blades made in the works have small projecting pips, at the tip ends, which serve as integral rivets. On assembly, the tips of groups of blades, at certain stations in a turbine, are embraced by arcuate flat-section strips, with holes through which the projecting pips on the blades pass. Subsequently, the pips are riveted over, and with this arrangement the rigidity of the blades in service is greatly increased. For the same reason, a group of blades, particularly of the longer type, may be reinforced by means of a small-diameter wire which passes through holes at the approximate centres of the blades, and is subsequently secured by various methods, including welding.

The projecting pip at the tip end of a blade is often required to be machined, sometimes to a shape which approximates to that of the blade section, but on a much smaller scale. On some blades, the pip portion is brought to the required shape by milling on the special purpose machine shown in Fig. 4. The cutter spindle of this machine is housed in a vertical quill, arranged for adjustment by rack and pinion, and is carried in a saddle which can be traversed horizontally on the slideways *K*. Drive to the spindle is provided by the flange-mounted motor *L*.

In the close-up view in Fig. 5, the cutter spindle, work-fixture and work-table are shown more clearly, also a typical blade *M*, with the machined pip at the end nearer the camera. To the left of the blade can be seen a backing-up piece, which is made from a low-melting-point alloy and is shaped on one side to fit the convex surface. This backing-up block is inserted in the fixture, after the blade has been loaded, and the pegs projecting from the sides engage with slots in the fixture, to retain it in position vertically. Subsequently, the stirrup-type clamp *N* is applied to thrust the backing-up piece against the blade, and to lock the latter in the fixture. In Fig. 5, there is a finish-machined blade in the fixture.

Various swivelling adjustments are provided for the fixture, to facilitate setting the blade at the required angles in relation to the centre line of the spindle. Flanges on the fixture enable it to be clamped in the bore of a circular table *P*, which can be driven by power and is carried in bearings in a heavy cast member *R*. The latter, which is approximately pear-shaped, is supported on the under-side by the main bed of the machine, and is free to oscillate about the vertical pivot indicated at *S*.

In operation, a blade is loaded into the fixture and the cutter head is traversed by hand, to the left, up to a dead stop on the rail. There are two cutters on the spindle, arranged coaxially, the larger of which can be clearly seen in Fig. 5. The smaller cutter is obscured, but is arranged to project below the larger by an amount equal to the required height of the pip on the blade. During the traverse movement of the head just described, the larger cutter makes a pass across the end of the blade, which is thus trimmed to the required length. The smaller cutter also starts to machine the end of the blade, and when the cutter head is arrested by the dead-stop, a step has been produced.

Next, with the cutter head stationary, drive to the rotary table is engaged, and the fixture starts to turn. Around the periphery of the table there is a cam ring, as at *T*, which is held in contact with a free-running roller *U*, Fig. 4, by a spring

in the housing *V*. The roller *U* is in a bracket secured to a fixed part of the machine. As a result, the table *P* is caused to oscillate about the centre *S*, this oscillating movement being superimposed on the rotation. With this arrangement, the smaller cutter is caused to machine a pip, with a periphery of the required, "oval" form.

A wide variety of blades is accommodated on this machine, including those up to 36 in. long mentioned in the previous article, and by substituting different cam rings, pips of various shapes can be produced.

Chaphone Vertical and Horizontal Honing Machines

Honing equipment designed by Chaphone Engineering Developments, Ltd., Royal House, South Parade, Sutton Coldfield, Warwicks., was until recently marketed by another company. The Chaphone company are now sole builders of machines and tooling of their own design. Vertical honing machines are available in three basic sizes, designated CV2, CV3 and CV5, and an example from the range is here shown.

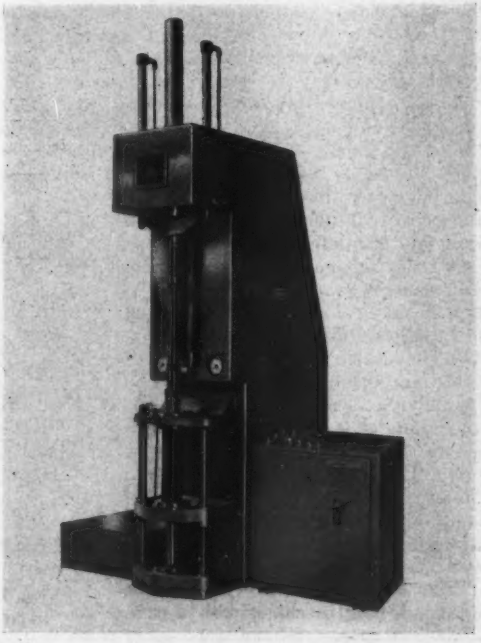
The type CV 2 and CV 3 machines have a capacity for honing bores from 1 to 6 in. diameter, for maximum depths, respectively, of 24 and 36 in. Main drive is taken from a 5-h.p. motor, and the spindle speeds can be varied steplessly from 65 to 400 r.p.m The throat depth is 12 in. Bores from 2 to 8 in. diameter can be honed for a maximum depth of 60 in. on the type CV 5 machine, and the steplessly-variable spindle speeds available range from 70 to 300 r.p.m., drive being taken from a 10-h.p. motor. This machine has a throat depth of 11 in. On all the machines in the range, the traversing speed for the spindle can be varied steplessly from 1 to 12 in. per sec.

Honing is carried out on a fully automatic cycle, normally under the control of a timer, which has a working range from 0 to 15 min. If required, automatic air-operated work sizing equipment can be provided. The honing spindle can be caused to dwell at either or both ends of its stroke for variable periods up to 15 sec. under the control of a second timer. Operation of a rotary switch, when the machine is working, enables a reduced stroke to be obtained, so that honing takes place on a particular portion of the bore. Electrical equipment, also the timers and controls, are housed in a separate floor-mounted console.

With the "rigid" type hones normally provided, the stones are expanded hydraulically under controlled pressure, through the medium of push rods and conical end pieces which engage with wedges. These hones are available with different numbers of stones from 3 to 8, depending upon the diameter. Alternatively, patented "flexible" hones can be supplied, in which the stones are moved radially, independently of each other, by hydraulic means, so that they follow the shape of the bore.

The part to be honed is clamped endwise hydraulically under a pre-set pressure, and coolant is fed to the upper end of the work-holding fixture, to be dispersed evenly round the bore. Contaminated coolant is passed to a clarifier. An interlocking arrangement is incorporated which prevents the operating cycle from being started until the work has been clamped. Alternatively, a T-slotted work-table, or a traversing-type or rotary indexing fixture can be provided.

A type CH 10 horizontal honing machine, which has a length capacity of 10 ft. is available for honing of bores from 2 to 8 in. diameter. In addition, the type CV 5 and CH 10 machines can be supplied with increased work capacities, which enables bores as large as 14 in. diameter to be honed. Single- and multi-spindle horizontal units are available with length capacities up to 35 ft.



Typical Chaphone CV vertical honing machine

Making Components for Type Casting and Composing Machines

Methods and Equipment Employed by the Monotype Corporation, Ltd., Salfords, Redhill, Surrey

By P. A. SIDDERS, Chief Associate Editor

PREVIOUS ARTICLES IN THIS SERIES* on the practice of the Monotype Corporation, Ltd., Salfords, Redhill, Surrey, were concerned with the production of the matrix case for the "Monophoto" Filmsetter, and the associated cover plate; the machining of composite cams used on that machine, also on conventional type casting machines made by the company; the milling and checking of notch bars; and examples of high-rake slab milling. Other examples of the machines and tooling employed by the company for the production of components for type casting machines are here considered.

The matrix case incorporated in a "Monotype" Composition Caster contains 255 matrices, each with a female impression corresponding to one of the male characters of the type that is to be produced. Under the control of a punched paper ribbon, produced on a "Monotype" Keyboard, the matrix case assembly is moved to position the required impression over the cavity in a mould assembly. Metal is injected into the mould through a nozzle, and the mould cavity forms the body of the individual piece of type, while the matrix cavity forms the character. Reference will be made to the mould assembly in a later article.

Nozzles are made from either En. 1A steel or stainless steel, and a typical nozzle (of the first mentioned material) is seen at the right in Fig. 1. The nozzle shown has a hole of 0·128 in. diameter, which must be held within ±0·001 in., and the maximum eccentricity over the full length of 2⅞ in. must not exceed 0·004 in. For drilling nozzles, the Monotype Corporation has designed and built a special-purpose machine which operates on a semi-automatic cycle.

Fig. 2 is a general view of the nozzle drilling machine, with certain of the guards, which normally enclose the cutting zone, raised to show the drill chuck and work-carrying slide. The machine bed is mounted on a swarf tray, which has an integral cutting oil sump, and the tray is supported on two cast legs. Of box type, the machine bed carries a drilling spindle head at the left-hand end. The drilling spindle runs in a pair of angular-contact ball bearings, and is driven by V-belts from a ½-h.p. electric motor at the rear. A Jacobs chuck is mounted on the end of the spindle to hold the drill, which, for the component seen in Fig. 1, is a No. 30 size, long series. Control of the spindle head motor, also the coolant pump motor, is by push-buttons at the left-hand end of the bed. It may be mentioned here that Cutmax cutting oil (Edgar Vaughan & Co., Ltd.) is used, to which molybdenum disulphide is added to prevent the swarf from sticking to the drill and work.

For producing the holes in the nozzles, the drill is run at 3,700 r.p.m., but it does not move axially. The work and guide bush are carried on a slide, which is advanced towards the drill by an

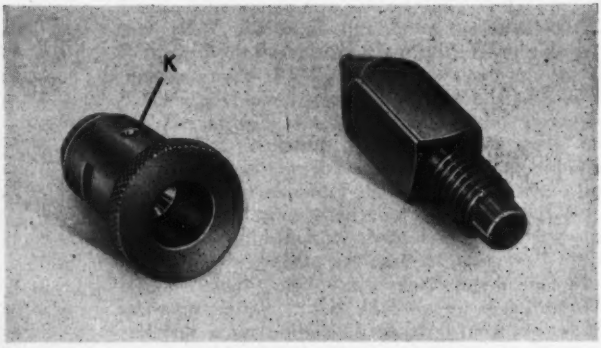


Fig. 1. A nozzle for the injection of molten type metal is seen at the right, with a bush for the location of the small end, and for guiding the drill, on the semi-automatic machine developed by the Monotype Corporation

* MACHINERY, 98/988—3/5/61 and 98/1392—21/6/61.

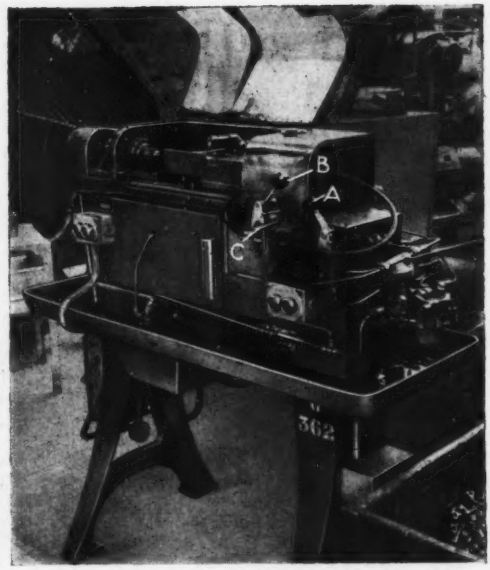


Fig. 2. General view of the semi-automatic nozzle drilling machine which has been designed and built by the Monotype Corporation. The work-carrying slide is advanced, at rapid and feed rates, towards the drill, and withdrawn intermittently for swarf clearance

air-hydraulic system. A feed rate of 0·0008 in. per rev. is employed for the drilling traverses, and the machine is designed to provide for drilling in ten steps, with rapid withdrawal for swarf clearance, and rapid advance to within a predetermined distance from the bottom of the hole produced at the preceding stage. This distance is usually about $\frac{1}{32}$ in., but may be modified, as will be explained, and at the end of a complete cycle, the machine is stopped with the work in the fully withdrawn position.

It will be seen that there are two Enots air valves at the right-hand end of the machine bed, and the valve *A* is a master control for the supply of compressed air to the machine. The valve *B* is the operating control for the work clamping unit, and a safety device has been fitted, to ensure that the valve cannot be inadvertently reset by the operator when he is loading a workpiece or making adjustments. A bracket bolted to the machine bed carries a lever *C*, which is pivoted at a point about two-thirds along its length. Under the action of a tension spring, the lever is normally swung in the horizontal plane so that its shorter end engages the rocker below the valve operating handle. In consequence, the handle cannot be moved from the position shown without first displacing the lever, against spring tension, and the operator must have both hands clear of the working zone before the work can be clamped.

In addition to controlling the work-clamp unit, the valve *B* starts the supply of cutting oil. A pipe from the valve connects with a small air cylinder at the rear of the machine bed, which is coupled to a 2-way valve in the cutting oil supply system. When the valve *B* is moved to clamp the work in position, air is admitted to the cylinder, and the 2-way valve is reset to direct cutting oil to the work-support bush. The clamping circuit is interlocked with the main operating circuit of the machine, and the start-cycle push-button (seen below the valve *B*) is not effective unless the valve *B* has been operated and the work clamped. Two push-buttons at the left-hand end of the machine control the drill-spindle motor.

WORK LOCATION AND CLAMPING

A close-up view of the working zone of the machine is given in Fig. 3. The work-carrying

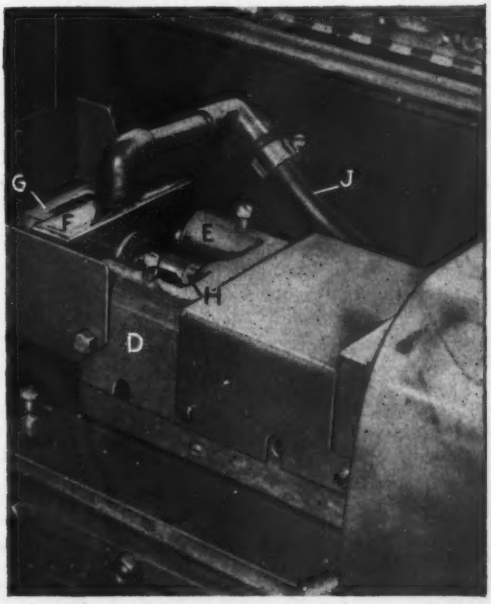


Fig. 3. Close-up view of the work-carrying slide of the nozzle drilling machine. Cutting oil is delivered to the bridge member carrying the bush for locating the small end of the work

slide *D* moves in rectangular-section guideways, which are provided with gib adjustment. At the right-hand end of the slide there is an air cylinder, visible through the Perspex cover, and the piston rod of the cylinder is connected to a cross-head. The cross-head is mounted at one end of a pair of cylindrical sliding members, which pass through bushes in housings, as at *E*, at either side of the slide. At the other end of the sliding members is mounted a bridge unit *F*, with a yoke *G*, wherein is fitted a secondary guide bush for the drill.

On the side of the bridge unit remote from the yoke there is a seating for a work-support bush, shown at the left in Fig. 1, and the knurled head of this bush is just visible in Fig. 3. The work-support bush has a central stepped hole, with the larger end towards the head. At this end, the hole is slightly larger than the threaded portion of the workpiece, to provide clearance, and a conical seating face is formed at the junction of the large and small portions. The smaller hole serves as the main guide for the drill.

For loading, air is directed to the right-hand end of the air cylinder for the slide, by moving the lever of the valve *B*, Fig. 2, to the setting shown, and the bridge member is moved towards

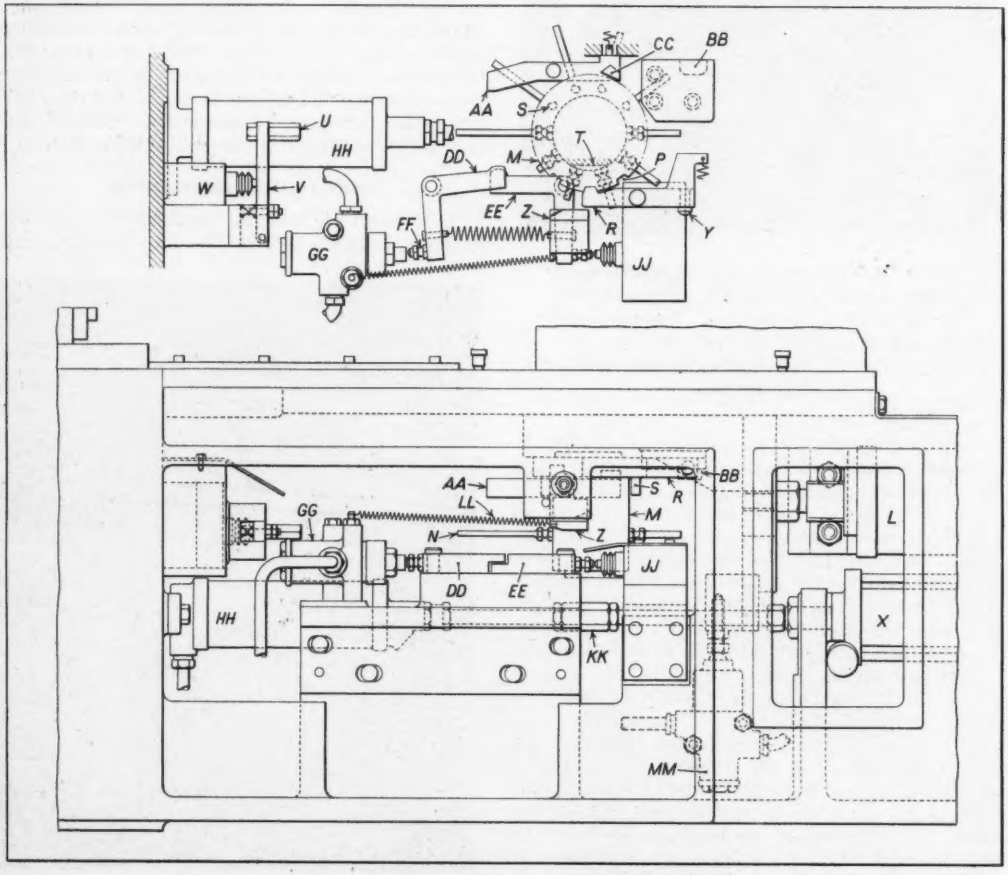


Fig. 4. Details of the mechanism of the semi-automatic nozzle drilling machine are here shown. Reversal of the work-carrying slide at the end of each feed motion is effected by the tripping of a limit switch by one of ten stops on a turret which is indexed automatically. To ensure that the feed motion is engaged when the end of the previously drilled hole is just clear of the drill, an air cylinder moves the piston of the hydraulic check cylinder a small distance backwards before each rapid advance movement

the left-hand end of the machine. A nozzle to be drilled is then loaded, large end outwards, with the threaded portion resting in the bore of the bush. The lever of the valve *B* is next reset, and the air supply is directed to the left-hand end of the cylinder, to urge the bridge member towards the right-hand end of the machine. During this movement, the conical end of the workpiece is engaged with a conical seating in the head end of a bush *H*, Fig. 3, mounted in the slide, and motion continues until the reduced diameter portion at the end of the thread of the workpiece is engaged with the conical seating in the bush on the bridge member. The nozzle to be drilled is thus securely clamped and aligned with the drill by the centring action of the two conical seatings.

During the drilling operation, cutting oil is supplied to the bridge member by way of a flexible pipe *J*, and it passes through a hole in the member to the hole *K*, Fig. 1, and thence to the drill. Excess cutting oil and swarf falls through the slot in the bush, and an opening in the bridge member, on to a perforated metal strainer plate in the tray below, whence the oil is returned to the tank.

AUTOMATIC MACHINE CYCLE

The automatic cycle and associated control arrangements will now be described with reference to Fig. 4. This figure shows a partial side elevation of the bed, with certain covers removed, also a plan view of some of the principal elements of the mechanism, without the surrounding casting and subsidiary details. At *L* is seen one end of the air cylinder for traversing the work-carrying slide, and below it is the end of the hydraulic check cylinder *X* which is employed to control the slide feed rate for the actual drilling movements.

Extending downwards from the slide there is a stout spindle, whereon the turret *M* is supported on taper roller bearings. The turret carries ten stop pins, the longest of which is indicated at *N*, and the lengths of the other pins decrease progressively to provide for evenly graduated drilling stages. Each pin is screwed into the turret and has a limited amount of axial adjustment. At the upper end of the turret there is a flange wherein are milled ten evenly-spaced notches of trapezoidal form, as indicated at *P*. These notches are engaged, in turn, by a locating pawl *R*, to lock the turret in such positions that one of the stop pins is aligned with the direction of slide travel. The pawl *R* is pivoted below the slide, and is urged into engagement with the notches of the turret by a tension spring. Projecting downwards from the turret flange there are ten pegs, as at S, to correspond to the stop pins. Some of these pegs have been omitted from the plan view, for clarity. At the bottom of the turret body is machined a flat face *T*, the purpose of which will later be explained.

At the start of a drilling cycle, after the workpiece has been clamped, the work-carrying slide is advanced by the air cylinder *L* at a fast traverse rate, until the hydraulic check cylinder *X* is engaged. The slide then advances at a pre-set feed rate for the first drilling stage. This movement continues until the longest stop pin contacts the striker *U*, to move the lever *V* and trip the limit switch *W*. The lever *V* is pivoted in a yoke block, secured to a transverse wall of the machine bed, and it has a transverse hole through which a stud with a pair of nuts passes, to restrict movement away from the limit switch. When the limit switch *W* is tripped, a solenoid valve is re-set, to change over the pressure and exhaust connections to the feed cylinder *L*, and the movement of the work-carrying slide is reversed. The piston of the hydraulic check cylinder remains stationary, and the return movement of the slide takes place at the fast traverse rate.

During the return movement, the domed button *Y* at one end of the locating pawl contacts the inclined face on the withdrawal plate *Z*, which is pivotally mounted on the machine bed. The plate is prevented from turning by a pin at one side, so that the pawl is swung out of the notch in the turret flange. As the return movement continues, the indexing pawl *AA* is engaged by one of the pegs (as at *S*) below the turret flange, and the turret is turned to move the next shorter stop pin into the axial position. As the pin approaches this setting, the movement of the slide carries the domed button on the locating pawl clear of the withdrawal plate *Z*. The pawl is then swung inwards by the action of the associated spring, and bears against the periphery of the turret flange, in readiness to enter the next notch. Just before the locating pawl enters the notch, a projection *BB*, on a plate screwed to the under-side of the slide, engages a mating projection *CC* on the end of the indexing pawl. As the slide continues to withdraw, the projection *BB* swings the pawl clear of the peg on the turret flange, as the locating pawl engages the notch.

Towards the end of the withdrawal movement, the turret body contacts the ends of the toggle levers *DD* and *EE*, which are pivoted on a block secured to the machine bed. As a result, the ends of the levers remote from the turret are moved outwards, against spring tension. Each lever carries an adjustable trip screw, as at *FF*, and one of these screws (on the lever *DD*) actuates an impulse valve *GG*, which directs air momentarily

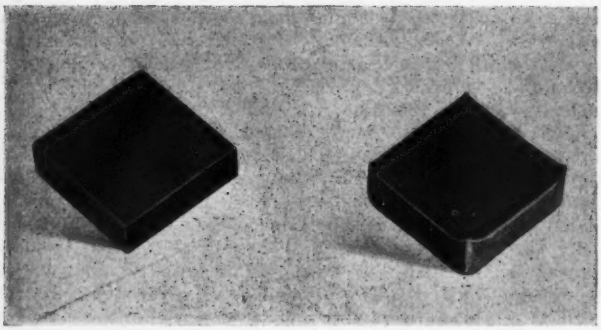


Fig. 5. Blanks for the production of large type matrices are here shown after being cut off (left) from leaded bronze bar, and sized in a carbide die

to the cylinder *HH*. The flow of air to the cylinder is governed by the setting of an adjustable restrictor valve (not shown).

The trip screw on the toggle lever *EE* actuates a limit switch *JJ*, which operates a solenoid valve to reverse the pressure and exhaust connections to the cylinder *L*, and thus cause the work-carrying slide to be again advanced at the fast traverse rate. It will be appreciated that unless special provisions were made, the end of the hole so far produced in the workpiece would then contact the end of the drill at high speed, with consequent danger of tool breakage. For this reason, the piston rod of the cylinder *HH* is coupled to the extension of the piston rod of the hydraulic check cylinder *X*, and part of the adjustable connection is indicated at *KK*. The momentary delivery of air to the cylinder *HH* causes the piston of the check cylinder to be moved to the right, so that the reduction in traverse rate of the slide to the drilling feed takes place just before the end of the previously drilled portion of the hole in the workpiece contacts the drill. By adjustment of the flow restrictor valve, the amount of "hold off" can be varied, and, as previously mentioned, is usually about $\frac{1}{32}$ in.

During the advance of the slide, the locating pawl again contacts the withdrawal plate Z. Since the pawl is now moving in a direction opposite to that during the return motion of the slide, the plate is swung about its pivot, away from the pin at one side, against the pull of the tension spring *LL*, and the pawl remains in engagement with the notch in the turret flange. Once the pawl has moved clear of the plate, the latter is swung back into contact with the pin in readiness for the next indexing sequence. As the slide is advanced, moreover, the indexing pawl *AA* is moved outwards, against the action of the associated spring, by the pegs on the turret flange, also by the block *BB*. Advance of the slide continues until the stop pin in the turret, in line with the direction of movement, again trips the switch *W*, and the withdrawal, indexing and "hold off" setting motions are then repeated.

The slide completes successive cycles, moving progressively further towards the drilling head, until the hole in the work has been completely drilled. Withdrawal of the slide is then controlled by the shortest stop pin, and during the withdrawal movement, the turret is indexed to move the longest pin into the operating position, as shown. When the turret is in this setting, the flat face *T* allows it to move away from the drill-head end of the bed without actuating the toggle levers *DD* and *EE*. Withdrawal then continues, and towards the end of the withdrawal movement, the valve *MM* is tripped by a screw, carried by a bracket attached to the slide. This valve also directs air to the cylinder *HH* to move the piston of the hydraulic check cylinder to the correct position for the control of the feed rate at the start of the next drilling cycle.

Reference has already been made to the push-buttons at the right-hand end of the machine, below the air valves in Fig. 2. These push-buttons are connected to the solenoid valves actuated by the limit switches *W* and *JJ*. One provides for initiating the forward movement of the slide to start the automatic cycle, and the other is used for reversing the slide in an emergency. For the nozzle shown in Fig. 1, the complete 10-stage drilling cycle occupies 1·25 min.

MAGAZINE-FED SIZING TOOL FOR MATRIX BLANKS

Matrices for "Monotype" type casting machines are made from a leaded brass, and the matrix blanks for the Super Caster and Type & Rule Machine are cut from bar of 1 by 0·265 in. section, to obtain the required directionality of grain. A blank is seen at the left in Fig. 5, and it is cut to a length of 0·999/0·996 in. After the blanks have been cut, they are transferred to a Rhodes 20-ton power press, equipped with a magazine-fed tool, which provides for sizing, also for producing rounded corners on the blanks. A blank after the press operation is seen at the right, and the dimension across flats is 1·000/0·999 in. The radius of each corner is specified as 0·070/0·080 in., and the

dimension across the corners, after rounding, is 1·354 in.

Fig. 6 is a close-up view of the sizing tool on the Rhodes press, and it is fitted with a tool-steel punch *A* and a die made of Prolite tungsten carbide. Blanks are sized in batches of 32,000, and the press runs continuously at 42 strokes per min. At the time that this article was prepared, the tool had been used for sizing 2¼-million blanks, and the die showed no signs of wear.

The magazine *B* is of vertical chute-type, with side members of channel section, and it has capacity for about 60 blanks. Each channel member is machined lengthwise so that it engages the blanks at four positions, thus minimizing any tendency for sticking to occur due to the presence of dirt or burrs. A feeding slide, below the magazine, transfers one blank at a time to a position above the die, at each press cycle, and the blank is thrust by the punch out of the feeding slide and through the die. Movement of the feeding slide is effected by the lever *C*, pivoted at one side of the tool base, and this lever is actuated by a push bar *D*, which is moved to and fro by a cam plate *E*, secured to the punch plate of the tool. The cam plate has a dog-leg track, which embraces a roller that runs on a pivot pin fitted to the push bar *D*.

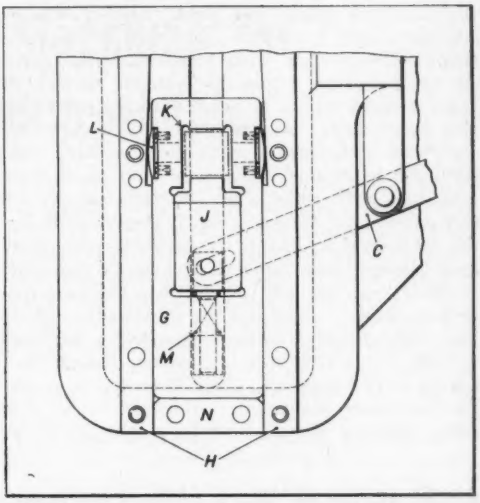


Fig. 7. Details of the work-transfer slide for the magazine-fed press tool are here shown. The blank is gripped by an auxiliary slide and two plungers to ensure that it is orientated correctly

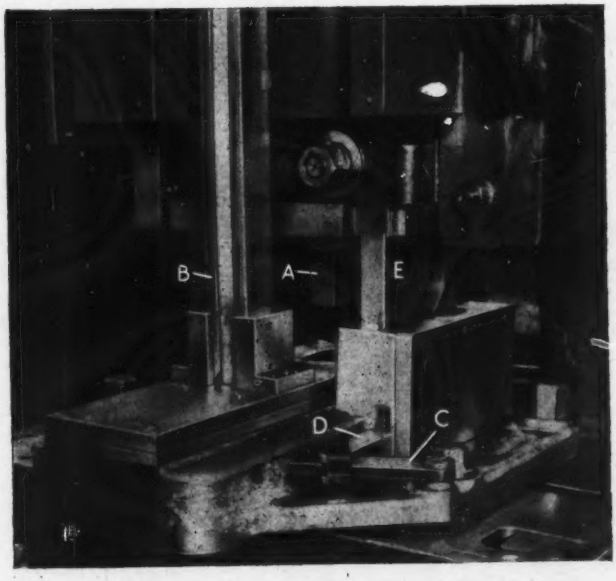


Fig. 6. The magazine-fed press tool employed for sizing matrix blanks. A tool steel punch is used with a carbide die, in which more than 2½-million blanks have so far been sized without measurable wear

Details of the construction of the feed slide may be seen in Fig. 7, which has reference letters to correspond with Fig. 6, where applicable. Indicated at *G*, the feed slide moves between the hardened and ground steel guide strips *H*, which also support a cover plate, not shown in the illustration. The feed slide, which is not connected directly to the operating lever *C*, incorporates an auxiliary slide *J*, that is free to move in an aperture. A pin projects downwards from the slide *J*, and is engaged by a slot cut in the end of the operating lever. At the end nearest to the punch and die, the aperture in the feed slide forms a 3-sided nest, as seen at *K*, which is 1⅛ in. wide, to provide ample clearance for the blanks. At each side of the nest there are holes wherein slide plungers, as at *L*, which are of rectangular cross-section with domed heads, and are urged outwards by springs.

When the ram of the press rises, the operating lever, under the action

of the cam plate and push bar, moves the auxiliary slide *J* towards the front of the press. The auxiliary slide then compresses the spring *M*, supported on a peg that extends horizontally from a block which is integral with, and below, the feed slide. As the spring is compressed, the feed slide moves with the auxiliary slide, until the latter unit reaches the end of its travel and the feed slide abuts a stop bar *N*. In this position (as shown in Fig. 7) the plungers *L* in the feed slide are thrust outwards, by the associated springs, into tapered pockets in the guide strips *H*, and the distance between the inner end of the auxiliary slide and the parallel face of the feed slide provides ample clearance for the work.

With the slides in this position, the stack of blanks in the magazine drops downwards so that the lowermost blank enters the nest in the feed slide. During the next cycle of the press, the auxiliary slide is moved towards the die. The upper surface of the slide, at the front end, is machined to an angle of 3 deg., and as the slide moves inwards, the front edge thrusts the lowermost blank into contact with the opposing face of the nest, and the inclined surface lifts the stack of blanks slightly so that they rest on the top face of the auxiliary slide. Once the blank from the bottom of the stack contacts the nest face, both the auxiliary and feed slides move together towards the die. As these members are advanced, the plungers in the feed slide are moved inwards by the action of the inclined sides of the pockets in the guide strips *H*. In consequence, the ends of the plungers close in on the blank, which is then firmly gripped and correctly orientated relative to the die.

A final article in this series will be published shortly in MACHINERY.

Applications of Black-Moly Lubricants

The Black-Moly range of molybdenized lubricants is produced by John Miller & Sons, Ltd., Brighouse, Yorkshire, and a booklet recently published by that company draws attention to the increasing range of applications for these products. For heavy-duty plain bearings, for example, the application of Black-Moly in a highly-concentrated paste form has been found to reduce operating temperatures considerably. Following initial treatment with Black-Moly paste, a Black-Moly grease is used, and the action of the bearing is sufficient to pressure-bond a film of solid lubricant to the journal and bearing surfaces, thereby preventing the metal-to-metal contact.

Anti-friction ball and roller bearings are treated in two stages. Black-Moly paste is applied to the bearing surfaces initially, and type M.P. "Q" grease is then employed for lubrication during service. High-speed bearings, particularly for aircraft use, should be washed with carbon tetrachloride or trichloroethylene before the paste is applied. It is claimed that in some instances the life of anti-friction bearings has been increased by as much as 500 per cent by this treatment.

Significant reductions in running temperatures, and increases in working life, are said to be obtainable by the use of Black-Moly powder as a lubricant for fabric bearings. A predetermined quantity of highly-refined Black-Moly powder is added to the fabric material during manufacture, and subsequently the bearing is lubricated by the application of the same powder suspended in a non-petroleum base carrier.

Difficulties are often experienced with threaded connections which are exposed to high temperatures during service, for example, screws incorporated in welding fixtures, and nuts and studs on furnaces and boilers, and similar equipment. The mating threads become "welded" as a result of the heat, and flame-cutting may be necessary when dismantling cannot be carried out in the conventional manner. Seizure of this type, it is stated, can be avoided by the application of Black-Moly paste to the mating threads before assembly. Although the torque required to release nuts and screws which have been treated in this manner is greatly reduced, the strength of the connection is said to be unimpaired. The paste can also be used to advantage for reducing slip/stick characteristics of working threaded assemblies, for example, traverse screws and nuts, also screws on power presses. Other applications include the lubrication of heavily-loaded transmission gears and worm and wheel reduction units, also slideways.

The company's lubricants can also be employed to facilitate assembly procedures, notably those involving the press-fitting of components. Galling, seizing, and picking-up can largely be eliminated, and it is stated that the loads required to assemble parts may often be reduced by as much as 50 per cent. Another interesting application of Black-Moly paste is as a lubricant for the tools and the work during thread-rolling operations.

Mention may also be made of the company's range of Black-Moly soluble cutting oils, which were developed primarily to assist in the machining of high-tensile steels, vanadium, stainless steels, and the range of Nimonic alloys. In some instances tool life is reported to have been increased by approximately 40 per cent.

Goulder Testing Machines for Worms and Worm-wheels

IN THE ACCOMPANYING ILLUSTRATIONS are shown three machines which have recently been supplied by J. Goulder & Sons, Ltd., Kirkheaton, Huddersfield, to meet particular requirements for testing certain types of worms and wormwheels.

The type 2H "long bed" lead tester shown in Fig. 1 has been developed from the company's smaller capacity machine (see MACHINERY, 91/544—6/9/57), which is based on an original idea of Dr. H. E. Merritt, who acts as consultant to the firm. This machine is covered by Patent No. 864,020. A number of long bed lead testers has already been built and others are on order, and the machine illustrated is particularly intended for checking worm drives for high-speed lifts. It will handle worms up to 8 in. diameter, and the maximum length that can be accommodated between the work-head and tailstock centres is 54 in. Worms with integral shafts, which weigh up to 150 lb., can be held between the centres. Alternatively, a helical gear, for instance, with a maximum weight of 50 lb., can be mounted on the faceplate. Heavy workpieces can be rolled into the gauging position on ramps secured to the bed, and in this way, the risk of damaging the guideways is avoided.

Made from Nitralloy steel, the work-head spindle is mounted in six rows of balls housed in cages within the bore of a hardened steel sleeve. When testing is in progress, the spindle —and with it the workpiece—is rotated and simultaneously moved in an axial direction by a motor-driven friction disc which is held in contact with its periphery at an angle to the centre line. This arrangement is similar to that employed on the smaller-capacity machine, and full details were given in the earlier article. Coarse and fine adjustment is provided for tilting the friction disc through various angles to give different axial movements during one revolution of the spindle, and setting is made with the aid of a circular scale and microscope unit which has been specially designed by Hilger & Watts, Ltd. The spindle has a maximum axial movement of 5 in., and any lead from zero to infinity can be obtained.

The checking cycle is started by moving a control lever on the front of the bed, which causes a locking arrangement for the spindle to be released, and simultaneously starts the driving motor for the friction disc. When the lever is released at the end of the checking cycle, the drive is reversed, so that the spindle is returned to its starting position. The motor is then stopped, and the locking arrangement for the spindle is brought into operation.

Supported by ball bearings which run on the vee and flat bed-ways, the tailstock is connected

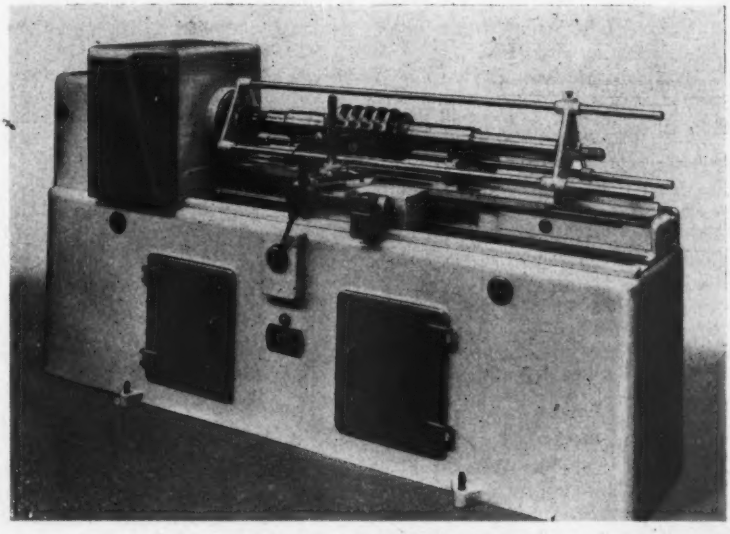


Fig. 1. Worms up to 8 in. diameter, with integral shafts up to 54 in. long, can be handled on this Goulder type 2H "long bed" lead tester

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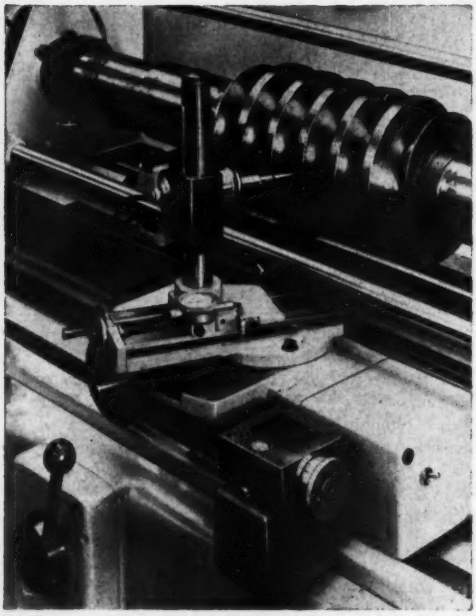

Fig. 2. Close-up view of the measuring head provided on the lead tester shown in Fig. 1

to a bracket on the work-head spindle by cylindrical bars, and when testing is in progress, it slides with the workpiece.

Shown in the close-up view Fig. 2, the measuring head is mounted on a cylindrical column attached to a slide, and this assembly is carried on a swivel base. The slide can be traversed towards and away from the centre line of the work by a hand-wheel-operated screw. As with other Goulder machines which are here described, the measuring head may be connected to either a Talymin Series 3 recording unit (Taylor, Taylor & Hobson) or a Parnum gauging unit and pen recorder (Buck & Hickman, Ltd.), and for carrying out tests for lead, the work is rotated and traversed in contact with the "stationary" stylus pin. When helicoid worms or hobs are to be tested for involute form, the measuring head is adjusted on the column, so that the stylus pin is set above or below the centre line of the work at a distance which corresponds to the base circle radius. The swivel base is then set to the appropriate base lead angle, and the slide is traversed with the stylus in contact with the work flank, at a tangent to the base cylinder. When there is no error in involute form, a straight-line graph is produced.

A new feature on the tester here described is the provision of a Hilger & Watts linear scale and projection screen which enables the measuring head to be moved on the bed-ways through a pre-set distance, for instance, when a multi-start worm is to be checked for spacing errors. The stylus pin is brought into contact with the worm at the same radius for each reading with the aid of a dial indicator on the measuring head slide.

In Fig. 3 is shown the Goulder No. 3 worm tester, which has been supplied for checking large-diameter hobs, also worms which have integral shafts up to 48 in. long. The left-hand tailstock incorporates an indexing mechanism, which enables hobs to be checked for spacing of the cutting edges, and the slide which carries the measuring head can be traversed by means of a screw, so that the spring-loaded stylus pin can be moved in contact with the work flank. Provision is made for moving the saddle for the measuring head on the bed-ways through pre-set distances, as required, for instance, for checking hobs and worms for pitch, with the aid of slip gauges and a dial indicator as shown in the close-up view Fig. 5.

The No. 4/3 testing machine shown in Fig. 4 has been specially designed for checking worms for pitch, lead, and form, also for carrying out com-

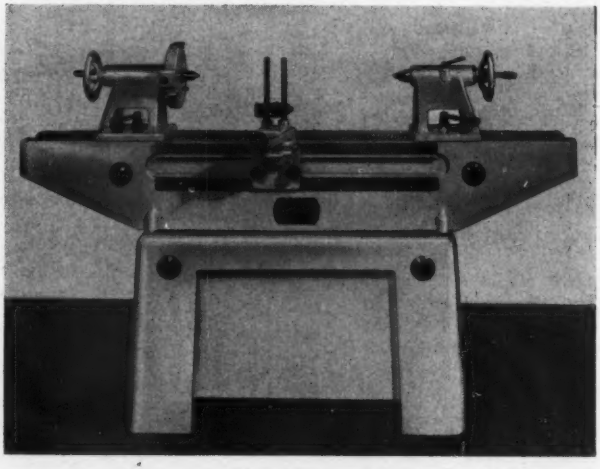

Fig. 3. Goulder No. 3 testing machine for large-diameter hobs and worms

posite tests on mating worms and wormwheels, which can be run in mesh with each other either at the designed centre distance or under spring pressure. Two saddle assemblies of standard designs, as normally employed on other testing machines in the Goulder range, are provided for testing worm drives with wheels from 3 in. diameter, which weigh only a few ounces, up to 48 in. diameter and weighing as much as 6 cwt. The smaller saddle is the No. 3 size, which enables a mating worm and wormwheel to be run in mesh under a spring pressure of 8 oz. to 4 lb. It is employed when worm gears of the smaller sizes in the range handled by the machine are to be tested. The larger saddle is a No. 4 size, of modified design, which incorporates two spindles, mounted in taper roller bearings, to take wormwheel arbors, and enables contact pressures from 8 oz. up to 20 lb. to be applied to a mating worm and wormwheel. An auxiliary slide may be mounted on the bed to take a measuring head of similar design to that shown in Fig. 5.

Worms which have integral shafts up to 72 in. long can be held between centres, mounted on slides which can be adjusted independently by handwheel-operated screws on columns on the bed, and set for height with the aid of matched scales. The left-hand assembly incorporates an indexing mechanism. A vertical bore is provided in the top face of the bed to take a mandrel on which a gear of a pair may be mounted. The other gear may be carried on a second mandrel held in the bore of a spindle on one of the saddles. With this arrangement, rolling tests may be carried out on two gears which have p a r a l l e l centre lines.

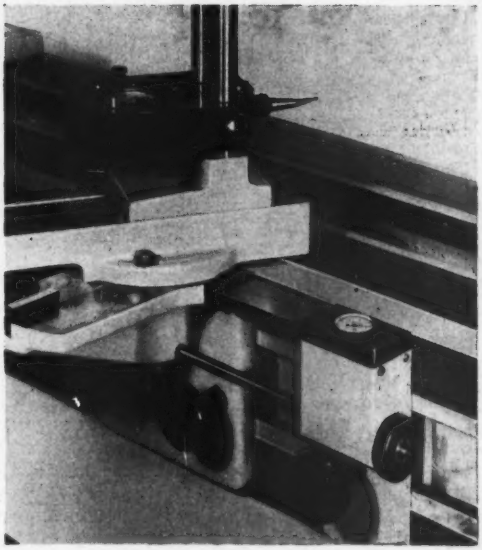

Fig. 5. Close-up view of the dial indicator head which is employed in conjunction with slip gauges for setting the measuring unit in different positions on the bed

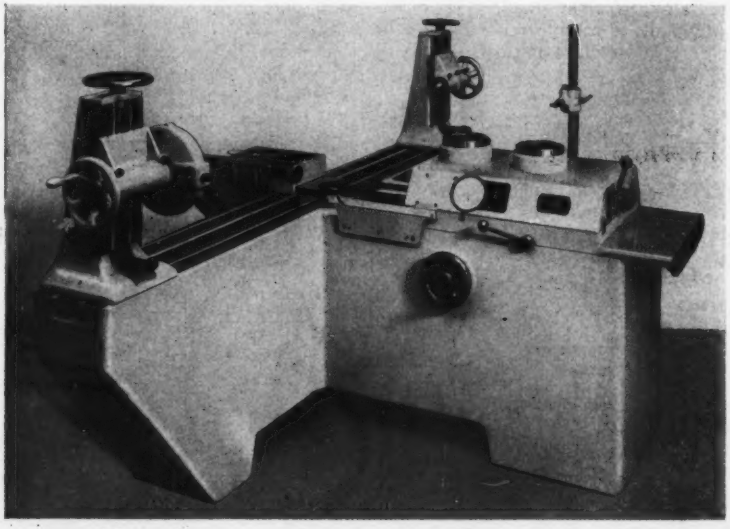

Fig. 4. This Goulder No. 4/3 testing machine has been specially designed for checking worm drives which have wheels ranging from 3 to 48 in. diameter. Light- and heavy-duty saddles are provided which are brought into use as required, according to the size of the worm gears to be tested

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EVALUATION OF π. As a machine reliability test, E.M.I. Electronics, Ltd., recently programmed an EMIDEC 1100 electronic computer to calculate the value of π. The result was given to 10,880 decimal places, and involved 35 million separate calculations, representing 13 hours computing time.

K2

Peco Rotothrust Injection Moulding Machines

INJECTION MOULDING machines in the Rotothrust range, which has been introduced recently by Projectile & Engineering Co., Ltd., Thessaly Road, London, S.W.8, incorporate an injection unit of new design, in connection with which a number of patent applications has been made. In this unit, pre-plasticizing of the hopper-fed moulding material takes place under the action of a long, high-tensile steel screw, which is rotated inside a barrel with an X-Alloy corrosion-resistant lining. The screw is moved axially during the injection stage. Advantages claimed for the arrangement include improved mixing and dispersion, a high plasticizing rate, obviation of slip during the operation, and the minimum variation of the shear rate of the screw, to keep the temperature of the plasticized material within close limits. A range of screws is available, to give pressures on the material from 9,000 to 18,000 lb. per sq. in., and each screw is provided with a "valved" head, to reduce the risk of reverse flow during the injection stroke.

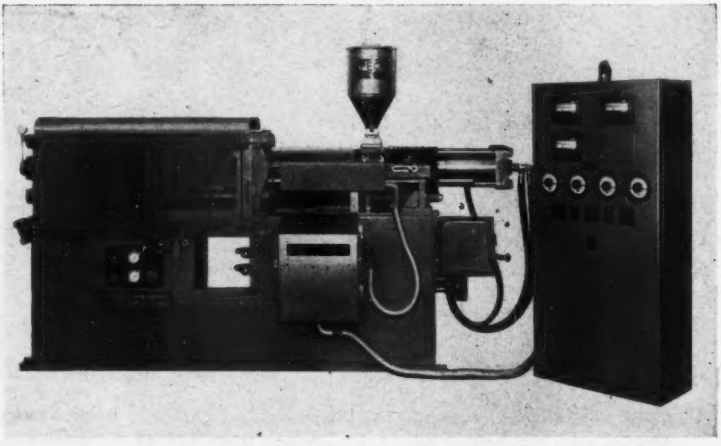
The machines are built in six sizes, with shot capacities from 5 to 8¼ up to 159 to 330 cu. in., and the No. 21MR shown in the accompanying illustration is the smallest in the range. Variation of the shot volume is made by means of an adjustable limit switch, and drive for the rotation and axial movement of the screw is taken from a hydraulic unit, which is so arranged that the full volumetric output of the pump can be employed for both stages. Steplessly-variable speeds are obtainable over a wide range, and on the larger machines there is a choice of two ranges. The unit also provides for absorbing, hydraulically, the axial thrust from the screw, so that the need for a thrust race is avoided, and the system includes an adjustable relief valve, for controlling the force applied. Fully-automatic overload protection is afforded.

For use with materials that have a low viscosity when molten, a 3-position shut-off injection nozzle is supplied in addition to a standard flat type. During moulding, the nozzle is retained at the mould sprue bush by a hydraulic cylinder, which is actuated to provide for automatically breaking the sprue portion from the workpiece during the normal operating sequence of the machine.

The mould closing force, from 80 to 750 tons, is applied to the moving platen by a hydraulically-operated toggle mechanism, and the working stroke can be varied by means of a screw. Setting of the moving platen in relation to a backplate is obtained by means of a large-diameter, buttress-threaded screw, and on the larger machines in the range, power adjustment is provided by an electric motor. Carried on hard chromium-plated ways on the bed, the moving platen and the backplate have phosphor bronze bushes and are guided on four alloy steel tie bars.

Provision is made for central or outside ejection, and an automatic central hydraulic ejector is available as extra equipment for the larger machines. Low pressure sensing equipment is available, to permit fully automatic operation, and hydraulic core pulling equipment, the control of which may form part of an automatic sequence, can also be supplied.

Peco injection moulding machines are sold by Peco Machinery Sales (Westminster), Ltd., 28 Victoria Street, London, S.W.1.



Peco No. 21MR Rotothrust injection moulding machine

Czechoslovakian Machine Tools at the Leipzig Fair

By R. E. GREEN, Associate Editor

EXAMPLES OF MACHINE TOOLS built by the 25 main factories which make up the Czechoslovakian machine tool industry were shown in that country's permanent pavilion at this year's Leipzig Spring Fair, and included several new developments. The Czechoslovakian industry, it may be noted, produces some 300 different machine tools, mainly of the more complex types, under the aegis of the Ministry of Heavy Industry. The industry is served by a specialized research institute (VUOSO), which passes on information to individual factories on such subjects as machine design, tools, production methods and heat treatment.

Several of the larger factories concentrate on particular types of machine tools, the TOS-Kurim factory, for instance, claiming to be among the largest producers of milling machines in the world, although horizontal borers are also built. Some details of this plant and of the machines made there were given in an article which was published in MACHINERY, 93/77—9/7/58. The exhibits at Leipzig included several machine tools which have already been described in MACHINERY,* notably the MAS, AB 80, single-spindle camless automatic turret lathe, which was fitted with automatic loading and unloading equipment and demonstrated in operation on stepped components.

Machines shown for the first time at Leipzig, but which had already been seen at last year's Brno Fair, included a vertical copying lathe with programme control by punched cards or tape, and a large jig boring machine, a close-up view of which is given in the heading illustration.

MAS, TYPE WKV 100 JIG BORING MACHINE

This type WKV 100 machine, also shown in Fig. 1, is built by the MAS Kovosvit factory at Sezimovo Usti, and has a table measuring 39·4 by 63 in. Hydraulic traverse at steplessly-variable speeds is provided for the table, over a distance of

* Cf. MACHINERY, 89/229—27/7/56, 92/1339—6/6/58, 93/77—9/7/58, 94/835—15/4/59, 95/385—2/9/59, 96/256—3/2/60, 96/613—16/3/60, 96/646—23/3/60, 96/670—23/3/60, 96/1463—22/6/60, 96/1585—29/6/60, 96/1612—29/6/60 and 98/45—4/1/61.

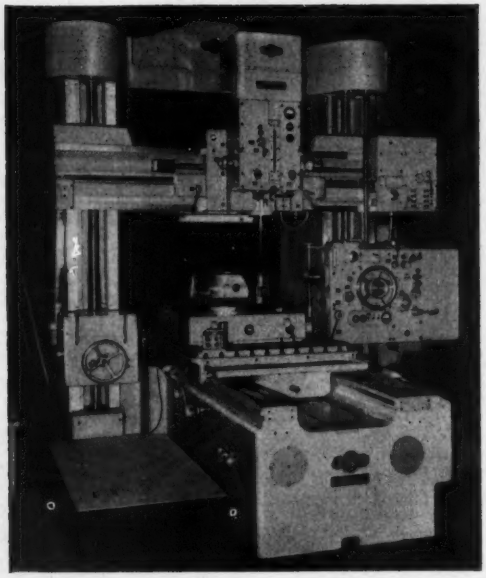


Fig. 1. Built by the MAS Kovosvit factory at Sezimovo Usti, this type WKV 100 jig borer has a table measuring 39·4 by 63 in., and the maximum height from the table to the nose of the vertical spindle is 40·5 in.

55 in., and it will support workpieces weighing up to 2 tons. The distance between the columns is 63 in., and the height from the table surface to the nose of the vertical spindle, in the retracted position, 40·5 in. The vertical spindle head can be traversed on the cross-rail over a distance of 39·4 in., and the cross-rail has 29 in. of vertical movement. During elevation or lowering of the cross-rail, its weight is relieved hydraulically, to reduce wear on the adjustment screws and to prevent misalignment which might be caused by off-centre positioning of the spindle head.

The horizontal spindle head, on the right-hand column, has a movement of 27·55 in., and the spindle axis can be positioned at any height above the table between 2·95 and 30·5 in. Each of the spindles is carried in a 4·72-in. diameter quill having an axial movement of 11·8 in., and has a special taper bore of 3 in 20 to hold the tools. There are 23 spindle speeds from 12·5 to 2,000 r.p.m., power being provided by motors of 5·3 h.p. Eight feeds, ranging from 0·001 to 0·025 in. per rev., are available for the quill of each spindle, for boring operations, and the heads can also be used for milling.

Feeds of 0·98, 1·97, 2·59 and 5·9 in. per min., for milling operations, are obtainable for the cross-rail head, and of 1·97, 2·79, and 4·72 in. per min. for the side head. In addition, the cross-rail head can be rapidly traversed at 59 and the side head at 39·4 in. per min. Both speeds and feeds are selected on dials and are engaged by means of push-buttons which control hydraulic cylinders to engage the gear trains. Clamping of the table and the spindle heads in any position is effected by hand levers, and the cross-rail is automatically clamped hydraulically when movement ceases and unclamped when a movement is engaged.

Positioning of the table in the longitudinal, the cross-rail head in the transverse, and the column-head in the vertical direction, is accomplished by means of a measuring system which incorporates scales graduated in divisions of 1 mm. (0·039 in.), attached to the moving elements. Made from special steel having low heat-expansion characteristics, these scales have highly-polished surfaces on which the divisions are engraved, and are read by means of optical projection systems housed in the bed, the side head and the cross-rail. Images of the scale divisions, magnified 32 times, are shown on projection screens beneath hinged covers.

An image of a graticule, in the form of two dark patches with a parallel-sided slit between them, also appears on each screen, and can be moved in relation to the scale graduations by means of a graduated drum and vernier. The drum permits adjustments of the graticule to 0·001 mm. (0·00004 in.). Rough positioning of the machine element is carried out with the aid of engraved scales fitted in exposed positions on the bed, column and cross-rail, with the graticule in the zero position. The appropriate scale line is thus centred in the graticule slit, and the latter is then moved in the required direction by the specified amount. Finally, the scale line is re-centred in the graticule slit by further small movements of the machine element, to obtain the final setting. Positioning with this system, it is stated, can be carried out with a repeatable accuracy within 0·005 mm. (0·0002 in.).

In addition to drilling, boring and milling operations, both spindle heads can be employed to cut internal or external screw threads by means of single-point tools. Change gears can be fitted in the train between the spindle and a leadscrew in each head to allow metric threads from 0·25 to 6 mm. pitch, and English sizes with numbers of threads per inch from 3 to 40 to be cut. A knurled ring on the special thread-cutting tool-holder enables the tool point to be rapidly retracted from the work so that threads can be safely cut close to shoulders on the work. A range of thread-cutting

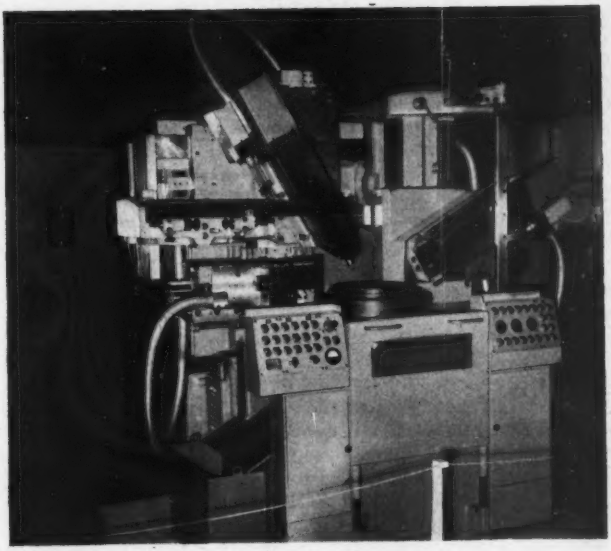


Fig. 2. This type SPK 63, vertical, hydraulic, copy-turning lathe or boring mill is intended for profile-turning heavy flange-shaped parts up to 24·8 in. diameter by 9·8 in. high, held on a face-plate or in a chuck

heads is available, suitable for thread diameters from 15 mm. (0·59 in.) upwards.

Facilities are also provided on each head for setting the drilling or boring depth by means of gauge blocks and a dial indicator, and many of the controls, especially for the vertical head, are duplicated to permit access from either side of the table. Support for boring and milling arbors is provided by a head on the left-hand column. The power-driven rotary table shown in position, in Fig. 1, is of 31·5 in. diameter, and weighs approximately 10 cwt. Approximate angular positioning of the table is obtained by motor drive, and the table can then be manually adjusted with the aid of an optical system and a scale and vernier which gives readings to 1 sec. of arc. Mechanical clamping is provided for the table. A rotary tilting table is available, also a range of tooling and other equipment.

PROGRAMME-CONTROLLED VERTICAL COPY-TURNING LATHE

The type SPK 63, vertical, hydraulic, copy-turning lathe or boring mill, shown in Fig. 2, was developed by the research institute (VUOSO), mentioned earlier, and was built by the MAS Kovosvit factory. Designed for turning and facing operations on parts of complex shapes, the machine has a capacity for work up to 24·8 in. diameter by 9·8 in. high. Components are easily loaded on to the 22·8-in. diameter faceplate, which is at a height of 40 in. above the floor. Alternatively, the spindle may be fitted with a hydraulically-operated chuck of 12·4 or 19·68 in. diameter.

Driven by a motor of 17·4/24 h.p., the spindle has 16 speeds of which 8 can be selected during any one

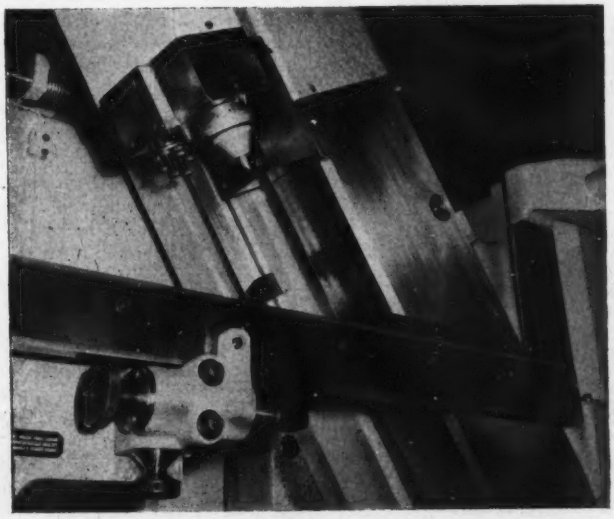


Fig. 3. Close-up of one of the hydraulic copy-turning slides on the machine in Fig. 2, showing the 6-position stop drum which is indexed as the slide is withdrawn and enables a maximum of six successive copying passes to be taken

machining cycle. Seven different speed ranges are available, and the normal range is from 22 to 710 r.p.m. Feed movements are applied to the three tool-slides hydraulically and they can be varied steplessly from 0·28 to 39·4 in. per min. During any set cycle, the feed rate can be changed automatically within the ratio of 10 to 1, and a maximum of three different feed rates can be used. Rapid advance of the tools towards the work is at the rate of 55 in. per min., and rapid withdrawal at 78 in. per min.

There are two copy-turning slides, and the slide at the right can be set at 60 deg., as shown, or at right angles to the spindle axis. Both external and internal copy-turning can be performed. Templates secured to the vertical holder at the right are engaged by the stylus of the copying valve at the outer end of the slide. The upper left-hand tool-slide is normally employed for copy-facing operations, but can also be applied to the periphery of the work. In addition, this slide can be utilized for such operations as turning, boring, recessing, and chamfering under the control of electrical limit switches and positive mechanical stops.

Both the copying slides are fitted with 6-position indexing stop drums, near the outer ends, as shown in the close-up view of the left-hand slide given in Fig. 3. As described in MACHINERY, 95/386—2/9/59, these drums enable a maximum of six successive copy-turning passes to be taken where large amounts of material must be removed from the work. Each drum is so arranged that it is indexed automatically when the tool-slide is withdrawn after each pass. When the slide is advanced towards the work, its movement is limited by one of the stops coming into contact with the face of a bracket secured to the stationary portion of the slide.

The advance of the tool is thus restricted by different amounts according to the setting of the stops, so that the stylus is brought progressively into engagement with the template. Only during the final pass does the tool reproduce the complete form of the template on the work. The lower left-hand tool-slide is designed for internal and external recessing, and plain facing and turning operations under the control of electrical and positive mechanical stops. A mechanical type of copying arrangement can also be used with the slide for machining internal and external corner recesses and surfaces of special shapes.

PROGRAMME CONTROL EQUIPMENT

The sequence of operations performed on the machine, also the various spindle speeds and feed rates for the different stages, are selected with the aid of punched cards which are inserted in panels containing electrical sockets. There is a single panel in the side of the right-hand column for the right-hand slide, and two panels in the left-hand column for the other two slides. A view of these two panels is given in Fig. 4, where electrical plugs have been inserted in the sockets through holes punched in the cards. These plugs complete circuits to various solenoid valves and relays.

Below each card panel there is a shaft carrying a number of angularly-adjustable drums, each with a projecting stop. Each shaft is connected to the particular slide which it serves by means of a flexible cable, so that it is rotated as the slide moves towards and away from the work. Switches operated by the stops on these drums serve to actuate solenoid valves for controlling the supply of hydraulic pressure oil to the slide-actuating cylinders. These switches are duplicated by rows of push-buttons on panels at the front of the machine, which are employed to move the slides when setting up.

Fig. 4. All three slides on the SPK 63 machine are programmed by means of punched cards with holes through which electrical plugs are inserted into sockets to complete control circuits

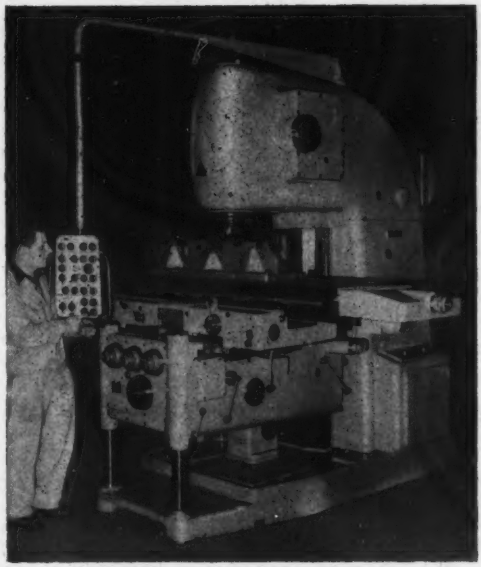


Fig. 5. Built in plain, horizontal and universal forms, in addition to the vertical type shown, the FB 50 V range of milling machines can be equipped for programme control of table movements in three directions by means of punched tape

PROGRAMME-CONTROLLED VERTICAL MILLING MACHINE

Built by the TOS-Kurim factory, previously mentioned, the type FB 50 V, Zbrojovka (Selson Machine Tool Co., Ltd.), vertical milling machine shown in Fig. 5, is the largest of a range which also includes plain horizontal and universal types. As described in the article already noted, which was written when the machine was in the prototype stage, the table measures 19·68 by 78 in., and has movements in the longitudinal, transverse and vertical directions of 55, 17·7 and 18·9 in. Driven by a motor of 17·4 h.p., the spindle has 18 speeds, ranging from 28 to 1,400 r.p.m., and carries a substantial flywheel within the massive housing.

The required spindle speed is selected by depressing push-buttons on the pendant control panel, which operate a hydraulic servo-motor unit, and the speed currently engaged is shown by a dial on the right-hand side of the head. To ensure rigid mounting of the spindle, no provision is made for axial adjustment. There are 24 feed rates, drive being taken from a separate motor of 4·3 h.p. at the left-hand side of the knee. In the longitudinal and transverse directions, the feeds range from 0·39 to 78 in. per min., and in the vertical direction, from 0·1 to 19·68 in. per min. The feeds, also, are selected by means of push-buttons on the pendant panel, and are shown by a double dial at the front of the knee.

Three dials at the front of the knee—one for each direction of movement—facilitate accurate setting of the traversing members. Rapid traverse is obtainable in the horizontal and vertical directions at 126 and 31·5 in. per min., and the table can be moved in two or three directions simultaneously, if desired. Provision is made for lowering the table through a distance of 0·020 in. at the end of a cutting traverse to avoid marring the finished surface during the return movement. An anti-backlash mechanism provides for climb milling and for pendulum-cycle operation.

PROGRAMME-CONTROL EQUIPMENT

Stated to be applicable to a variety of machines, the programme control system on the FB 50 V machine is based on graduated scales on the three

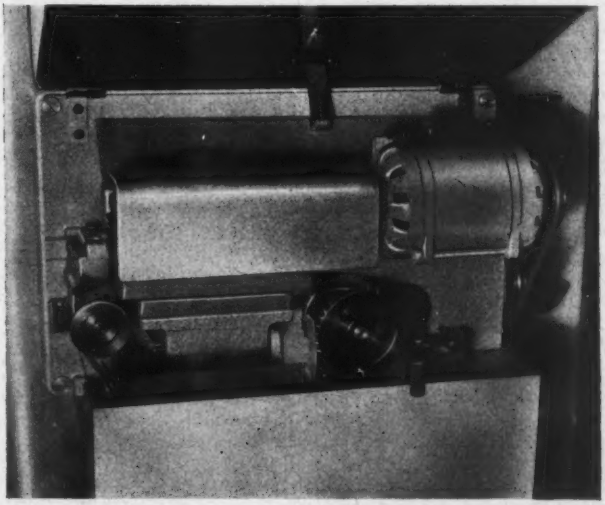


Fig. 6. The punched tape employed for programming the movements of the table on the FB 50 range of milling machines is in the form of 35-mm. film, which is advanced in steps into this reading unit by the small motor at the right

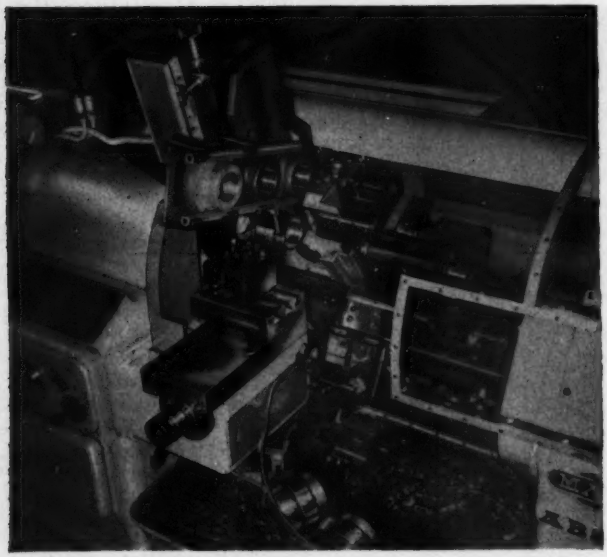


Fig. 7. For automatic loading of flanged components on the type AB 80 single-spindle, camless automatic, a magazine unit is carried on the nearly-vertical slide on the headstock face, and operates in conjunction with equipment on the turret drum

slides, which are photo-electrically scanned. Electrical pulses thus produced are fed into an electronic counting unit in the control cabinet, to provide a continuous indication of the table position in three dimensions. Although such an arrangement was not employed on the machine exhibited, it is stated that the system is suitable for complete numerical control and that equipment for this purpose has now been developed. When the machine illustrated is arranged for programme control, instructions are provided by means of a small tape-reading unit of special type. This unit, as shown in Fig. 6, is mounted on the side of the electrical cabinet.

The reading unit accepts standard 35-mm. wide, motion picture film, which is advanced by sprockets driven by the small electric motor at the right. The film is indexed through a distance of 3 in. at a time, and it passes through the reading head in which there are 16 rows of five contact plungers, making 80 in all. Only 30 of these plungers—or 6 rows of five—are employed for the control of a simple programme on the milling machine, and holes are punched in the film to correspond with the positions of those plungers through which circuits are to be completed to control various machine functions.

After the film has been indexed, instructions in the form of electrical signals which operate relays and solenoid valves, and re-set the electronic counting unit, are passed to the machine. These signals result in the selection of the required spindle speed, starting or stopping of the spindle, direction and length of movement of the table, and the feed rate. After the instructions have been fulfilled, a signal serves to restart the film drive motor, and the film is indexed through a further 3 in., bringing a fresh set of instructions to the reading position.

AUTOMATIC MACHINING OF FLANGED PARTS

Reference was made in MACHINERY, 96/613—16/3/60, to the type AB 80 (Elgar Machine Tool Co., Ltd.), single-spindle camless automatic, which is made by the MAS factory at Sezimovo Usti. At Leipzig, a chucking version of this machine was set up for second-operation turning of flanged components, with fully automatic loading and unloading. A close-up view of the set-up, showing the loading and unloading equipment, is given in Fig. 7. The partly-machined components are manually-loaded into a magazine chute carried on a nearly-vertical, hydraulically-operated slide, which moves on a guide secured to the front face of the headstock.

Before being loaded into this machine, the parts are bored, faced, and recessed, and at the start of the automatic cycle, the slide is fed down to a stop, to carry the lowest component into alignment with the spindle axis. This component is retained in the magazine by a spring-loaded finger, and a stub arbor, carried on one of the turret faces, is next advanced into engagement with the bore. The magazine slide is then retracted, the remaining components being permitted to move down, and the piece on the loading arbor is carried forward by the turret until it is positioned in the 3-jaw, hydraulically-operated, expanding chuck.

With the jaws expanded to grip the previously-machined recess, the turret is retracted and the spindle is started, at a speed of 250 r.p.m., which gives cutting speeds of 203 to 393 ft. per min. for the operations performed by the tools on the second turret face and the front cross-slide. These operations comprise boring and turning from the turret, and facing and chamfering from the slide.

At the next turret position, the speed is reduced to 180 r.p.m., and four turret tools are employed for boring operations, and two outside diameters are rough turned. The rear cross-slide operates in conjunction with the fourth turret tools, and has compound movements to provide for finish-turning the periphery while one bore is finished by the turret.

At the fifth position, the turret carries two recessing tools which are so mounted that they can be fed transversely by the front cross-slide after the turret has been advanced to bring the tools within the bore. For these last two turret positions, spindle speeds of 355 and 125 r.p.m. are selected automatically. The final turret station, shown aligned with the finished workpiece in Fig. 7, provides for unloading, and carries a sheet metal cradle of approximately the same form as the work. With the turret advanced, the chuck jaws are contracted, the part falls into the cradle, and the turret is then withdrawn and indexed.

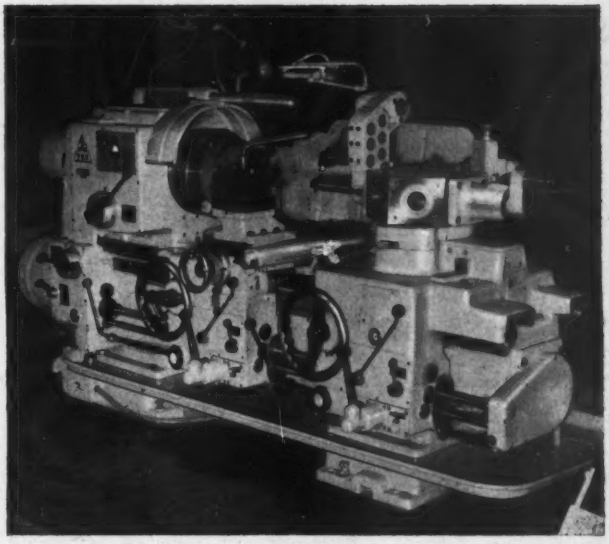


Fig. 9. This turret lathe from the R 80 range has feed and speed selection by lever. Machines on which these functions are controlled electrically, are also available

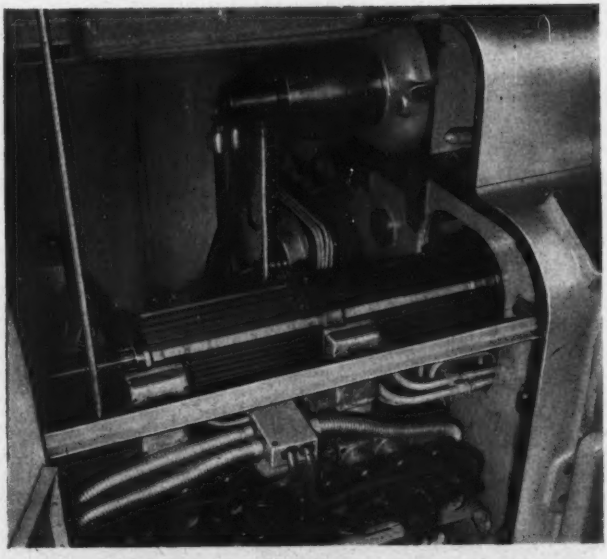


Fig. 8. Close-up view inside the casing at the headstock end of the AB 80 machine, showing the extension of the tool drum which carries the programme-control stops and the hydraulic cylinder for operating the chuck

This movement carries the cradle downwards, towards the camera in Fig. 7, so that the opening of the cradle is aligned with that of a discharge chute in the foreground. The finished part then rolls out down the chute. Feed rates of 0·39 to 10·4 in. per min. are employed during the cycle, with fast-rapid advance and withdrawal of the tools at 11 ft. per min. The cycle time for the operations described, including loading and unloading, is 6·8 min.

A close-up view inside the covers surrounding the rear end of the machine is given in Fig. 8, where the continuation of the hexagon turret drum is seen near the centre. Adjustable stops in T-slots in the faces of the drum operate micro-switches in the adjacent housings to start or stop such functions as rapid traverse, machining feed, direction of movement, and return of the turret. The stops also initiate the advance of the cross-slides and the nearly-vertical tool-slide (here used for the loading magazine), subsequent movements

being controlled by separate stops on the slides, which operate other micro-switches.

At the end of the forward travel of the turret, a switch is operated to start the return movement, and the turret is subsequently indexed automatically. The turret drum also carries a programming unit for speed selection, and any six speeds from the range of 12 available can be selected during any one cycle. Other stops on the drum provide for setting a hydraulic pressure distribution valve which determines the feed rates to be applied to the various tool slides.

RANGE OF PROGRAMME-CONTROLLED CAPSTAN LATHES

A range of heavy-duty capstan lathes made by the TOS Gottwaldov factory includes the types R 80 and RC 80 (Elgar Machine Tool Co., Ltd.), and one of the former is shown in Fig. 9. The swing capacity is 30 in. over the bed and 17 in. over the cross-slide, the maximum distance from the spindle flange to the turret face, 53 in., and the spindle bore, 3·5 in. Machines with bores of 4·37 in. can also be supplied, and are known as the R and RC 100. All four lathes can be fitted with hand- or pneumatically-operated chucks, or with electrically-operated chucks of the type described in MACHINERY, 95/1210—9/12/59.

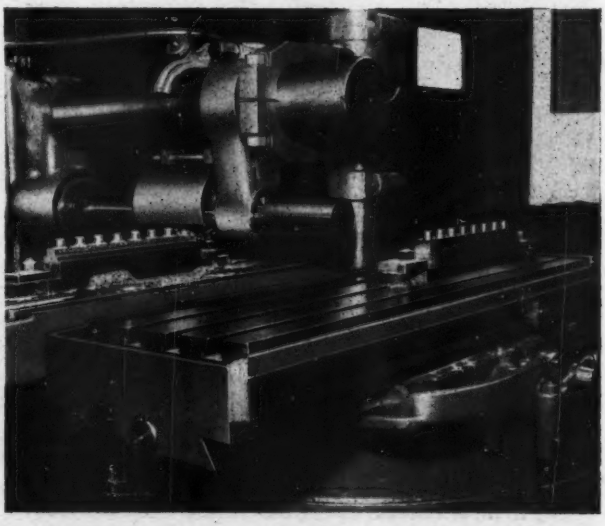
Drive is taken from a motor of 26·8 h.p., and is transmitted through an 8-speed gearbox in the headstock, changes being made by means of a lever on the type R, and electro-magnetically under push-button control on the type RC machines. The speeds range from 16 to 900 r.p.m., and the motor is of special design, braking torque being applied to reduce speed during gear changing. A roller chain transmits drive to the feed gearbox which provides nine changes on the type R, and eight on the type RC machines, the longitudinal feeds ranging from 0·002 to 0·05 in., and 0·002 to 0·08 in. per rev., respectively. Gearing in the apron enables these feeds to be doubled if required. Rapid traverse is also provided by a separate motor at the rate of 20 ft. per min.

These feeds apply to movements of both carriages, and the transverse feeds of the cross-slide are at approximately half the rates indicated. Thread cutting under the control of a leader and follower can also be performed, by means of an attachment on the saddle. There is provision for manual pre-selection of feeds on the RC machines, and equipment may also be fitted whereby both spindle speeds and feeds can be automatically engaged according to a pre-arranged cycle. A selector switch on the turret slide, geared to index with the turret, engages the pre-set speed and feed rates as the cycle proceeds.

Set-up for Milling T-nuts

Murray's (Pretoria) Engineering Co., Ltd., Pretoria Road, Romford, Essex, have established a production line for Murenco T-nuts and studs which are designed to fit T-slots in work-tables. The studs are made from high tensile steel and are produced in a number of standard lengths for each diameter. Special sizes can be supplied if required. T-nuts are made in 14 sizes to suit different T-slot measurements.

In the accompanying illustration is shown a Potter & Johnston "Twin-Rapid" milling machine provided with two work-tables which can be indexed through 180 deg. about a vertical axis. This arrangement enables one table to be loaded with parts while machining is in progress on blanks held in the other fixture, and idle time is thus substantially reduced. On the left-hand table eight nut blanks, held in the fixture by socket-head screws, are seen in process of being shouldered by straddle milling.



Straddle milling T-nuts on a Potter & Johnston machine at the works of Murray's (Pretoria) Engineering Co., Ltd.

DIE CASTING SUPPLEMENT

Works of Hills Precision Die Castings, Ltd.

Facilities for Production and Finishing Operations on Pressure Die Castings

By R. E. GREEN, Associate Editor

THE BIRMINGHAM FIRM of Charles Hill & Co., Ltd., was established in 1919, in Darwin Street, to make what is known in the trade as "coffin furniture," comprising ornamentation and handles for the coffin industry. Progress was steady, and in 1936 the company moved to larger premises at the present address in Cateswell Road, Hall Green, Birmingham, 11. Pressure die casting was early adopted as a method of producing coffin furniture, and orders for die cast components began to come in from a number of other industries. After some years, the volume of castings made for other applications became quite large, and an associate company, known as Hills Precision Die Castings, Ltd., was formed in 1944, at the same address, to cater solely for such work.

Although the volume of the company's products supplied to the coffin industry has remained at about the same level, the amount of pressure die casting carried out for other industries has now grown to about 75 per cent, by value, of the output of the two companies. About 17 tons of zinc and 3 tons of aluminium alloys are required weekly for the foundries, and the company employs some 350 people on a 2-shift system, and an office staff of 100. The night-shift consists mainly of workers in the foundries, and in the polishing and plating departments, and there are also some part-time workers engaged in assembly and packing of castings.

During the war, much of the company's output was for the Ministry of Supply, and subsequently contracts were obtained for castings for the motor vehicle industry, which is at present the largest customer. Castings, including door handle assemblies, are currently supplied to the Rootes Group, and directly and indirectly to the makers of Jaguar, Rover and Standard cars. Work is also undertaken for many other industries, and the company has a design and development department which will advise small firms without specialist design staffs, of the best methods of approaching different casting problems, also on the design of particular components.

In addition to producing the castings, the company is well-equipped to perform all the normal

finishing operations to customer's requirements, including machining, polishing, electrolytic and vacuum deposition, and assembly. As briefly reported in MACHINERY, 98/1151—17/5/61, the Hills factory has recently been considerably enlarged by the provision of an extension, with an area of some 17,000 sq. ft., which has enabled the various departments to be re-arranged for more efficient operation, and added some much-needed office space at the first-floor level. These offices, it may be noted, are carried on a steel girder of geodetic construction, with a depth of 7 ft., supported on stanchions spaced 72 ft. apart. This arrangement provides a floor space at ground level, which is completely free from columns.

WORKS LAYOUT

A layout diagram of the works is given in Fig. 1, the portion housed in the new extension being at the right-hand end. The factory now covers an area of about 47,000 sq. ft., and is arranged with the zinc and aluminium foundries along one side, at the top in the diagram. Castings are clipped, fettled, and sometimes partially machined in the foundries, as will be described, and may then be passed to other departments for finishing, or stored temporarily in the adjacent "work bank" area. This work bank enables castings which are called for in regular but small batches to be produced in larger quantities, with more economical operation of the die casting machines.

Stocks amounting to at least four weeks' supply, at the rate at which castings are normally requested by the particular customer, are maintained in the work bank, and quantities are brought out and passed through remaining stages, as required. The machine shop, in which operations such as turning, drilling and threading, are performed, and the polishing and plating shops, are situated on the side of the work bank area opposite to the foundries, and are so arranged that the work flows from left to right in the diagram. Part of the plating shop may be seen in the background in the heading illustration, which shows the heated cabinets in which racks of plated parts are hung to dry.

These racks are passed into the cabinets from the plating shop side, and withdrawn from the near side, where the parts are visually inspected and removed for packing, or passed to assembly. Simple fixtures are employed in the assembly area, which is concerned chiefly with motor car door handle units. The work flow continues to the right in Fig. 1, castings being passed through painting, vacuum-deposition, and packing departments, as required, to the warehouse and despatch areas at the side of the building. Sections at the left-hand end of the factory comprise the toolroom, tool stores, compressor house, and the die stores.

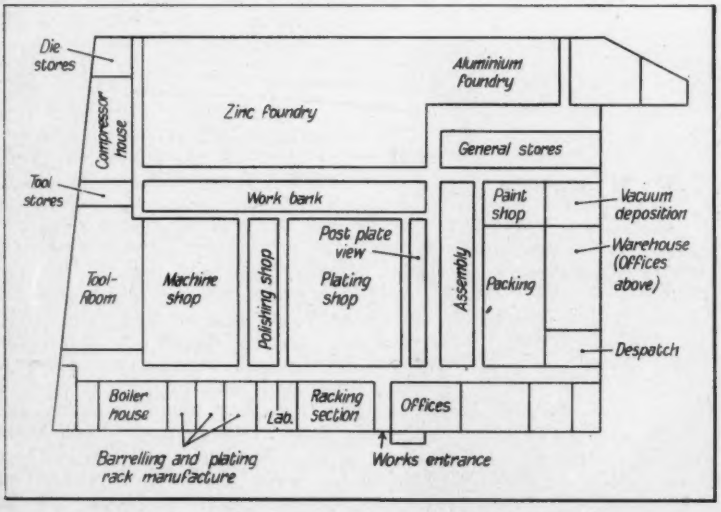


Fig. 1. Diagram showing the layout of the factory of Hills Precision Die Castings, Ltd., which has been made possible by the provision of an extension. New offices are at first floor level over the area at the right

Although most of the dies employed in the foundry are not large, there are several which weigh about 1 ton, and these heavier tools are stored on flat pallets in the Tiltrack unit shown in Fig. 2, which was constructed by Bertram Thomas (Engineers), Ltd. Each pallet measures 46 by 33 in., and is designed to fit into the angle-section framework shown, which incorporates support-pieces at various levels, to provide for different die thicknesses.

Pallets are moved into and out of the storage racks with the Lansing-Bagnall, electrically powered, fork-lift truck shown, the forks of which are carried in

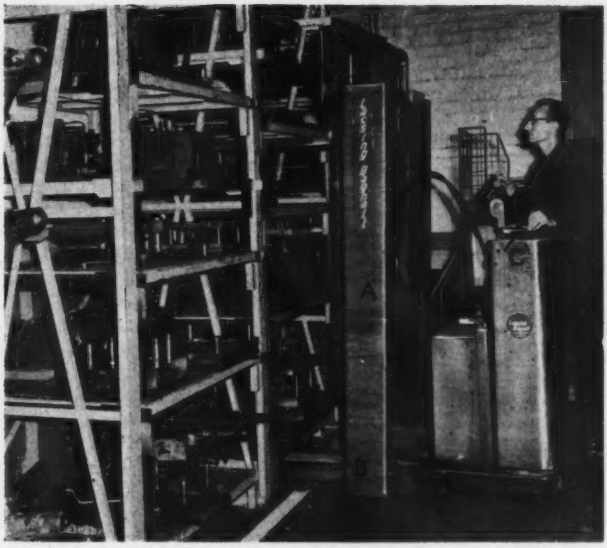


Fig. 2. In the die stores, heavy dies are transported and stored on a Tiltrack pallet and rack system by means of an electrically-powered Lansing-Bagnall fork-lift truck shown. The fork unit has horizontal and vertical movement

guides in the vertical channel-section frame *A*, and raised and lowered hydraulically. The frame *A* can be moved horizontally, on guides which form the main chassis *B* of the truck, to advance or withdraw the load. The truck is very manœuvrable, since the steerable wheel at the right-hand end can be turned through reduction gearing to any position by means of the handwheel *C*. This arrangement allows the truck to be brought to a position square with the rack, even if the spacing between racks is only just large enough to admit the length of the chassis.

The boiler house is at the front of the building, also laboratories for the control of the plating processes, a room in which parts are attached to plating racks, and a space devoted to the construction and repair of racks. A part of the latter area is devoted to barrel-finishing operations, and because the space is open to the main shop, each barrelling machine is fitted with a sound-proof cabinet, as seen in Fig. 3.

The panels that form the cabinet are of wood, to which sound-insulating material is attached, and they are so designed as to enclose the barrel completely during operation. The reduction in noise thus achieved is impressive, and the panels can easily be folded back or removed when the barrel is to be filled or emptied.

VACUUM-DEPOSITION

At present, vacuum-deposition is confined to the finishing of coffin furniture, and two units, of approximately the same capacity, are in use. A coat of lacquer is first sprayed over the areas on which a brightly polished finish is required, to fill the pores and imperfections and produce smooth, shiny surfaces. The castings are then carried through a stoving oven in which the lacquer is dried and baked hard.

After passing through the oven, the castings are loaded into special holders in a unit of the type seen in Fig. 4 (Vacuum Industrial Appliances, Ltd., Wishaw), in which they are held by clips

Fig. 3. To reduce noise, all the barrelling machines have been enclosed in cabinets with panels of sound-insulating material, which can be folded back or removed

designed to ensure that all the surfaces to be finished are fully exposed. The clips are supported on wires which extend between plates of triangular form on a number of horizontal shafts, which are carried in bearings in the front and rear plates of the frame.

At the far end of the unit, all the shafts are fitted with sprockets, and are connected by a continuous roller chain. The front and rear plates of the frame carry rollers, and the entire assembly can be moved on rails on the wheeled handling unit, which can be positioned so that the rails are aligned with others located within the vacuum chamber, seen at the right in the illustration.

MULTIPLE HEATING ELEMENTS

At the centre of the 26-in. diameter by 30-in. long vacuum chamber there are several heating elements with coils in which eight 3-in. lengths of aluminium wire, of 24 s.w.g., are placed before the machine is loaded. When the frame is pushed into the chamber, the heating elements project through an opening in the end plate so that the wires are positioned at the centre of the assembly. In the chamber, the roller chain is engaged with a driving sprocket, so that the castings can be rotated about the axes of the shafts on which they are carried.

After loading, the handling unit is removed, the door is closed, and a Kinney vane-type pump is started partially to evacuate the chamber. A vacuum of 0·001 mm. (max.) of mercury is then obtained by means of an oil-diffusion pump, the entire evacuation process occupying some 3½ to 4 min. The heating elements are then energized to vaporize the wire, and the driving motor for the shafts is started so that the parts are rotated, to ensure even distribution of the aluminium. A very thin layer of aluminium is deposited on the castings, amounting to approximately 0·000005 in., the process being completed in

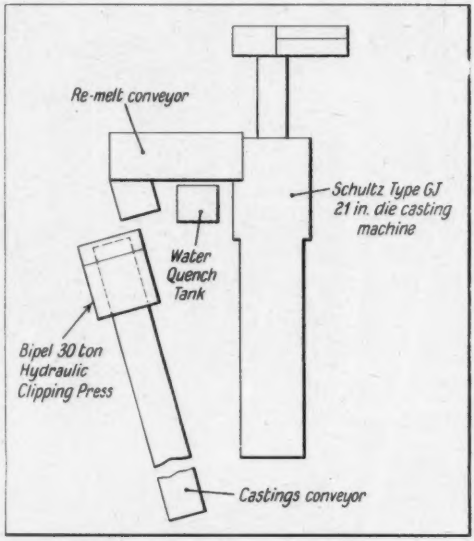

Re-melt conveyor
Schultz Type GJ 21 in. die casting machine
Water Quench Tank
Bipel 30 ton Hydraulic Clipping Press
Castings conveyor

Fig. 5. In the foundries, most of the die casting machines are arranged with water-quench tanks and trimming presses, tended by the casting machine operators. Castings leave the presses on conveyor belts leading to second-operation machines

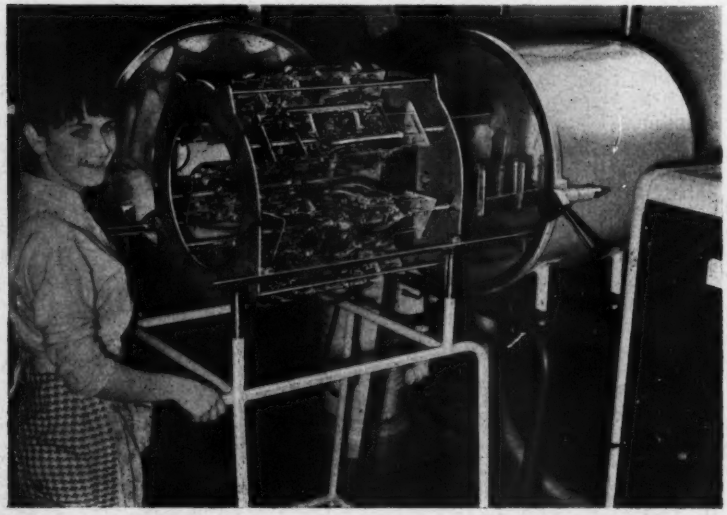


Fig. 4. The installation is employed for bright finishing coffin handle castings by vacuum-deposition of pure aluminium. Coatings of transparent lacquer are applied before and after deposition

about 10 sec. After the work has been removed from the chamber, another coat of lacquer is applied to preserve the brilliance of the deposit.

FOUNDRY LAYOUT AND OPERATION

In the aluminium foundry there are three Herbert - Reed - Prentice, 1½G, cold - chamber machines, and the extension has enabled space to be provided for another such machine, when extra capacity is required. In the zinc foundry there are three small Madison-Kipp (William Coulthard & Co., Ltd.), two E.M.B. No. 12, and seven Schultz (Vincent Engineering Co., Ltd.) type GJ, electronically-controlled, machines. It has been decided to adopt Schultz machines as standard, as far as possible, to provide for maximum interchangeability of dies. In both foundries, the die-casting machines are spaced fairly far apart to allow for the installation of associated equipment, such as a quenching tank and a clipping press beside each machine, as shown in the plan diagram in Fig. 5.

With this arrangement of the machines, clipping can be carried out by the operator during the idle portion of the casting cycle. Bipel (B.I.P. Engineering, Ltd.) hydraulic platen-type presses are employed for the clipping operations, and the tools are so designed that the components are pushed through the dies so that they fall on to conveyor belts beneath. Each conveyor carries the castings past a series of machines on which various operations are carried out such as broaching holes, drilling, tapping, and abrasive belt grinding. Some of the conveyors are seen in Fig. 6, which gives a general view in the zinc foundry.

The machines are mounted on wheels so that they may easily be moved into convenient positions beside the belt when the corresponding dies are in use. At the end of each belt the castings are inspected and are packed in box pallets for transport either to the work bank or to the machine or polishing shops. Typical machines employed for these operations will be described later.

Flash and runner metal left on top of each die after the completion of the automatic, single-stroke, cycle of the press, are swept by the operator on to another conveyor belt at one side. This belt lifts the surplus material and delivers it into a chute at the rear of the die casting machine, as shown in Fig. 7. The scrap falls down the chute into a hopper *D*, secured to a shaft which is carried in bearing brackets at each side of the furnace. At the near end of the shaft there is a lever which is connected to the ram of a hydraulic cylinder, and this cylinder is automatically energized during the opening movement of the die.

As the shaft is turned by the cylinder, the hopper is raised and the scrap slides out and is returned to the furnace. With the hopper in the raised position, the furnace opening is effectively screened to provide protection against metal splashing, and the furnace area is also fully shrouded during the operation of the machine, as a safety precaution. A small door in the shroud provides for the insertion of fresh ingot material, as required.

Water from the quenching tanks and from the die casting machines and dies, is circulated through a cooling system in the roof, and the temperature is thus maintained nearly constant. This temperature control enables the clipping dies to be

Fig. 6. General view in the zinc foundry, showing some of the conveyors along which castings travel from the clipping presses to secondary-operation machines for fettling, broaching, drilling, and tapping operations

designed with known dimensions in view, no allowance being made for temperature differences between one casting and another. Closer tolerances on the dies, and more even clipping of the flash are thus permitted.

CENTRALOGRAPH EQUIPMENT

All the Schultz machines and the associated clipping presses, also three independent clipping presses, are connected to a 10-unit Centralograph (Telephone Rentals, Ltd.) installation in the production-control office, so that a continuous record of their operation is maintained. The system affords the usual facility for printing code numbers on the moving charts to indicate the causes of any interruptions of production on the associated machines, by the action of dialling on post-office type instruments. For the die casting clipping installations, the code provides for indication of work by setters, maintenance, and toolroom men; metal or nozzle too cold; breakdown of the die, press tool, press, or conveyor; and completion of the required number of shots.

For the separate clipping presses, which are used in conjunction with other die casting machines in the zinc foundry, the Centralograph allows for recording seven causes of interruption, including setting, maintenance and toolroom work, faulty location of the work in the tool, breakdown of the tool or machine guard, and completion of the batch.

PRODUCTION CONTROL SYSTEM

In accordance with modern practice, the company employs a production control system to minimize, as far as possible, difficulties arising from variations in the setting and operation of die casting machines and the associated equipment. For each die a card is provided on which certain details are entered when the tool is proved and first put into production. Examples of the information entered on such a card include the plunger diameter, the pressure to be applied to the plunger during the shot, timer settings for the various stages in the machine cycle, such as slow injection, full pressure, and solidification, the complete cycle time, and details of the operator's working cycle.

The temperatures of the metal and the nozzle, frequency of lubrication at the various points, types of lubricant and methods of application, flow rate settings for the cooling water to each die member, and requirements as regards gooseneck condition, are also recorded. Other particulars include the die dimensions, whether the tool is of the unit type, and whether it is to be used in conjunction with a clipping installation of the type described above. A sketch on the back of the card shows the positions of the water-cooling channels in each die member. Information concerning the inspection of the castings is also included on the card, such as the quality of finish—suitable for plating, polishing or painting—required, and where to look for blow holes, porosity, runs, blisters, cold shuts, heat spots, and other defects.

Positions of cuts, dents or scratches which may be caused during the clipping or machining operations are recorded, also the posi-

Fig. 7. Runners and sprues from a trimming press for zinc die castings are swept by the operator on to a conveyor leading to the hopper *D*, which is raised to allow the material to re-enter the furnace during the die-opening portion of the cycle of the Schultz machine

Fig. 8. This view in the aluminium casting foundry shows one of the Herbert-Reed-Prentice 1½G machines fitted with a sliding guard and a stationary hood to cover the dies

Herbert-Reed-Prentice 1½G in Fig. 8. Installed in the aluminium foundry, this machine is operated in conjunction with the gas-fired furnace at the right, supplied by A.G.M. Industries, Ltd., and is fitted with an air-operated sliding guard of modified form, made by the Highwood Engineering Co., Ltd.

This guard has a sliding portion which includes a vertical panel on the operator's side, the top and far side of the machine being shrouded by a stationary hood. The vertical moving panel of the guard may be removed and replaced by alternative panels, which may be of special shapes to accommodate core slides and hydraulic core-operating cylinders. Hoods over the machine and the furnace are connected to a centralized air-extraction plant, whereby fumes are removed. The tions and sizes of cored holes. Provision is also made for checking the percentages of castings passing inspection, graphs being marked by a floor inspector to show tendencies which demand remedial action.

SAFETY PRECAUTIONS

All the die casting machines in use are fitted with sliding guards of the type described in MACHINERY, 93/1003—29/10/58, and considerable work has also been carried out in connection with further safety measures, as shown in Fig. 7. Another example of a machine to which effective guards have been applied is the

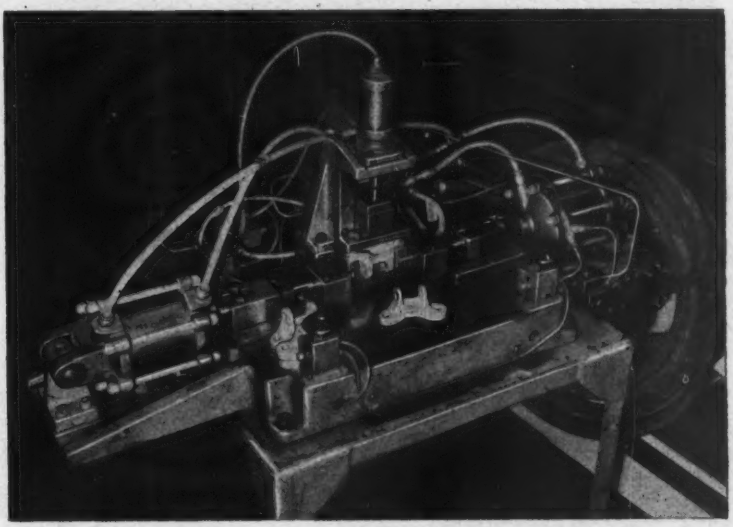


Fig. 9. Broaching operations on two holes in a zinc clutch withdrawal bracket are performed on this air-operated unit, which is installed alongside a conveyor belt when required

ducting leads through funnel-shaped units in which lubricant is trapped before the air is discharged to the atmosphere.

One of the machines designed for operation alongside a conveyor belt carrying castings from a clipping press is seen in Fig. 9, and it provides for broaching two holes in the zinc alloy clutch withdrawal bracket casting shown. The cored holes are of 0·438 in. diameter, one being round and the other having a flat portion at one side, and they require to be accurately sized. A casting is loaded into the central fixture with the ears containing the holes to be broached facing downwards, and is located by two holes in the mounting flange, which fit over dowels on supporting projections.

A clamping plate attached to the ram of the vertical air cylinder above the casting has holes in positions corresponding to those of the locating dowels, and when the two operating valves are depressed the cylinder ram is moved down to hold the part. Air is then supplied to the outer ends of the two horizontal, trunnion-mounted, air cylinders, by means of a pressure-operated valve, and the two broaches to which they are connected are forced through the holes. Each cylinder has a stroke length of 1·25 in., and each broach has five teeth. At the ends of the strokes, the air supply to the cylinders is immediately reversed, and the clamp is raised to release the casting for unloading.

Another—more elaborate—machine, for drilling and tapping five holes in a motor car trim component of complicated shape, seen in Fig. 10, is also wheel-mounted to enable it to be readily installed near the conveyor belt. A general view of this machine in operation was included in the preliminary report in MACHINERY, 98/1151—17/5/61, and it has a control unit, also mounted on wheels, with plug-in connector sockets. Built by the Bristol Tool & Gauge Co., Ltd., the machine has a 3-position indexing table, with three identical fixtures to hold the clipped castings. Each fixture has a series of steel blocks with channel-section grooves shaped to suit the contours of the casting, which is positioned by the end faces and held in place by a spring-loaded latch on the topmost block.

The front position of the table is employed for loading and unloading, and it is indexed to carry the casting to the right, where the five bosses are drilled with holes at various angles by a multi-spindle unit. This unit is carried on an air-operated slide which is first advanced to a set position with a locating dowel at the front engaged with a bushed hole in a block at the edge of the table. The drilling spindles are carried on slides actuated by hydro-pneumatic cylinders, and are driven by small electric motors. Two of the spindles are set at centres too close to permit the use of individual motors, and are driven from a single motor, through flexible shafts.

When the table is again indexed, the casting is carried to the station, at the left, where a similar head is employed for tapping, except that the spindles are advanced under lead-screw control. Finally, the casting is returned to the front, for unloading.

In a further article, the company's system of unit dies, which are employed both for casting and clipping operations, and some of the more interesting dies in use in the foundry, will be described.

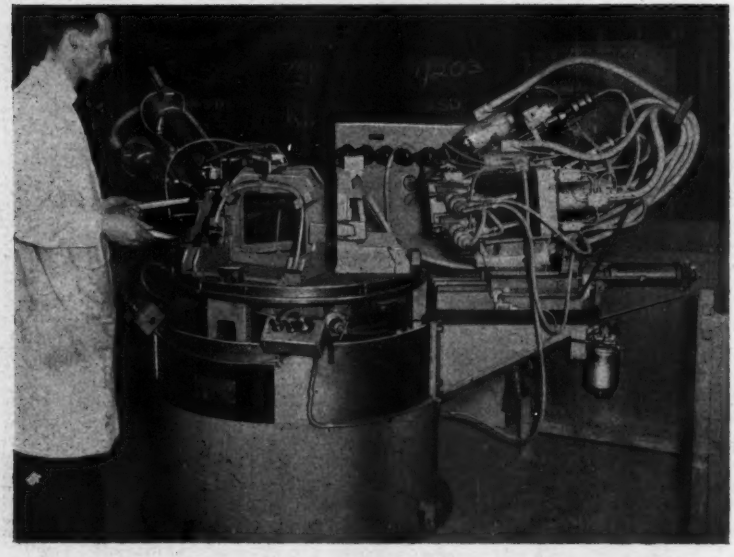


Fig. 10. Five holes are drilled and tapped in cast bosses on a motor car trim component on this special machine, which has a 3-position indexing table and is semi-automatic in operation

The Opening of the New Alfred Herbert Applied Research Department

Reference was made in MACHINERY, 98/1433—21/6/61, to the Applied Research Department which has been provided at the works of Alfred Herbert, Ltd., Coventry, as the final stage in a 6-year plan for the expansion of facilities for research and development which has involved a total expenditure of £2,750,000. Speaking on the occasion of the opening of this Department by The Rt. Hon. Reginald Maudling, M.P., President of the Board of Trade, the chairman and joint managing director of the company, Col. C. W. Clark, D.S.O., O.B.E., M.C., pointed out that whereas the engineering industry in Britain had repeatedly shown great inventive and designing ability and made first class products, it was equally important that the methods of production should be efficient and economical.

He went on to emphasize the fact that the developments which his company had undertaken in recent years to broaden the facilities for research had in no way been stimulated by popular interest in the subject which had recently been aroused.

The company's resources for basic research, he believed, were adequate in view of the extensive facilities available through such establishments as the N.P.L. at Teddington, and the N.E.L. at East Kilbride. Moreover, benefit was gained from the research and development work carried out by many firms from whom materials, electric and electronic equipment, and anti-friction bearings, for example, were purchased.

It need hardly be added, Col. Clark continued, that the highest importance was attached to the training of the technologists and technicians on whom reliance must be placed for carrying out the programme of research and development. In large measure, the company took care of the training of young people within the organization, with study periods at local technical schools. This method would be continued and improved, but it was only part of the answer to the problem of finding suitable staff in the higher spheres of science and technology as applying to production engineering. There was little in the field of academic training that was of greater importance to engineering progress than the provision of large numbers of highly qualified production engineers. Not only would they be the means of increasing efficiency in all British factories, but from their close association with the performance of machine tools they could contribute much towards the development of improved techniques. There were 45 colleges in Great Britain with courses in production engineering, but the numbers of students attending some of them were disappointingly low.

References were sometimes made to the alleged scarcity of ex-graduates employed in research and development work in the machine tool industry. He wished to make it quite clear that his company wanted the best brains available, and that it was fully recognized that after graduation any normally clever young man would be better equipped if employed on suitable tasks.

It was for this reason that the company made special arrangements for the post-graduate training of suitable young men. However, he would not concede that a degree, even with honours, was in any way a substitute for natural ability, energy, and a sense of purpose.

The Rt. Hon. Reginald Maudling said that the importance of the machine tool industry to our economy as a whole was certain to grow steadily, and that in quality and technical progress this industry must be at least equal to any other in

The Rt. Hon. Reginald Maudling, M.P., President of the Board of Trade, recently opened the new Applied Research Department at the works of Alfred Herbert, Ltd. He is seen with Col. C. W. Clark, D.S.O., O.B.E., M.C., chairman and joint managing director of the company (right) and Mr. B. C. Harrison, director of designs (left)

the world. The urge to broaden the industrial structures in the less developed countries would result in astronomical requirements for machine tools, at the same time there were good markets in the industrialized countries. Modern industry was rapidly growing more complex and machinery was becoming increasingly specialized, and these conditions led to an important cross trade in machinery and tools of all kinds.

If, as they hoped, it was possible to bring the division of Europe to an end, and achieve a single European market, which he believed to be of fundamental importance, there would be much more competition for our manufacturers to face but there would be wider opportunities as well. For the machine tool industry, the achievement of a home market of more than 200 million people would be a really great step forward.

The new research and development block afforded evidence of the company's understanding of the need for such work and of determination to allocate sufficient resources for the purpose. Important as it was that individual firms should do the maximum of research and development work on their own account, however, there was also work to be done in many industries by co-operative research. In particular, the Mitchell Committee had recommended that the machine tool industry as a whole should establish a research organization of its own. He was very pleased to know that the industry had acted on this recommendation and that a Machine Tool Research Association had been formed. He understood that there had been sufficient support from the industry to secure a D.S.I.R. grant. It was to be hoped, however, that more support would be forthcoming as the work of the Association became more widely known.

Palmer "Orbital" Argon Arc Welding Machine

Palmer Aero Products, Ltd., Herga House, Vincent Square, London, S.W.1—a subsidiary company of BTR Industries, Ltd.—have recently developed the "orbital" machine shown in Fig. 1 for circumferential welding of pre-formed pipes in stainless steel and nickel alloys on an automatic cycle, by the argon arc process. The machine is primarily intended for welding pipes for gas turbines which are made at the company's works at Penfold Street, Edgware Road, London, N.W.8, but is expected to find applications in connection with pipework for nuclear energy equipment, and for handling corrosive fluids at elevated temperatures in the chemical industry.

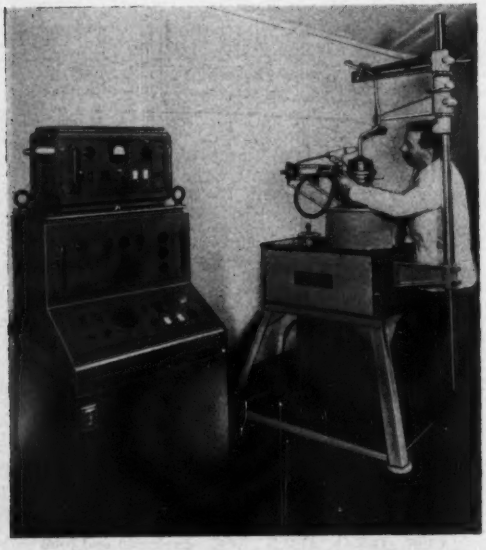


Fig. 1. Palmer "orbital" machine for argon arc welding of pipes and end fittings

The pipe to be welded is held either in a fixture or by clamps which are carried at the outer ends of arms adjustably-mounted on a cylindrical column, and the end fitting is normally mounted in a 3-jaw chuck as may be seen more clearly in the close-up view Fig. 2. This chuck is carried at the upper end of a shaft which is not rotated, but can be adjusted in a vertical direction for bringing the ends of the pipe and the fitting into contact, in readiness for welding. No consumable electrode is employed, but a small flange is formed integral with the end fitting, which is melted during the welding operation, to provide filler metal.

When the component parts have been set up, a push button on the control unit is pressed to deliver a supply of argon gas, for a pre-set period, for "purging" the welding head. Another push-button is then operated to start the automatic welding cycle, whereupon a motor-driven table which carries the welding head is turned until a detachably-mounted cam at the periphery actuates a micro-switch. The table is then stopped, the supply of argon gas is again turned on, and current is applied to the welding head to strike the arc. At the end of a variable dwell period, the table is once more rotated, to perform the actual welding operation, and is usually turned through two com-

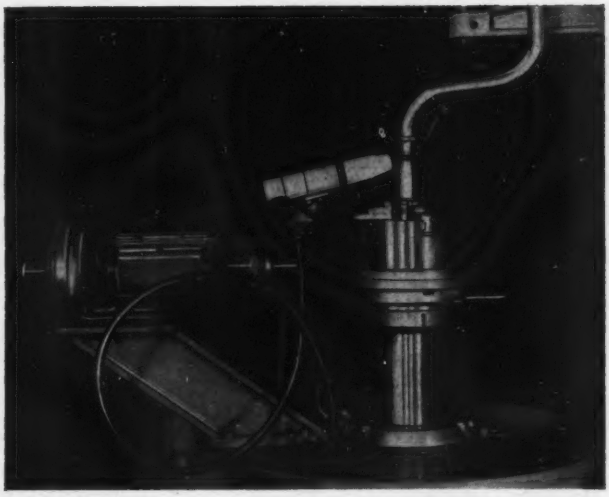


Fig. 2. Close-up view of the welding head and the chuck for holding an end fitting on the machine shown in Fig. 1

plete revolutions, to ensure penetration of the weld for the full wall thickness of the component parts. With this arrangement, the welding head is traversed round the work, to give a welding speed of about 20 in. per min. At the end of the second revolution of the table, another cam at the periphery operates a second micro-switch. The welding current and the table speed is then progressively reduced, to give arc decay, so that the weld is completed smoothly. Finally the table is stopped and the welding current and gas supply are cut off, to complete the working cycle.

Made by F. Hirschmann, Ltd., Fourth Way, Exhibition Grounds, Wembley, Middlesex, to the specification of Palmer Aero Products, Ltd., the control equipment is housed in a separate floor-mounted unit, and enables the entire welding cycle to be pre-set, so that the machine can be tended by an unskilled operator if required. A separate Hirschmann unit, mounted on top of the control equipment, serves to operate a low-inertial motor drive for automatically adjusting the electrode carrier on the welding head towards and away from the work, so that an arc of uniform length is maintained throughout the duration of the welding cycle.

This feature enables some non-circular shapes to be welded. Equipment which is being developed for use with the machine will enable profile shapes, such as mitred pipes, to be welded on an automatic cycle.

A faceplate or a jig, to suit the design of the end fitting to be welded, can be mounted on the shaft in place of the 3-jaw chuck. In addition, brackets of different forms from that shown in Fig. 2 can be mounted on the table to take the welding head, so that the electrode carrier can be presented to the work at various heights and angles.

Books Received

RESEARCH HIGHLIGHTS OF THE NATIONAL BUREAU OF STANDARDS—Annual Report 1960. United States Department of Commerce. Obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. 189 pp. [Price 65 cents.]

Following a general review of the work undertaken, more detailed information is given under some 18 headings which include, for example, metrology, electricity, mechanics, heat, chemistry, metallurgy, instrumentation, applied mathematics, building research, data processing systems, and radiation and atomic physics. There are eight appendices, one of which gives a list of publications in the Bureau's series that are available from the Superintendent of Documents, and others that have been published in various journals.

THE REPORT OF THE RESEARCH COUNCIL FOR THE DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH—1960. H.M. Stationery Office. 65 pp. [Price 4s.]

Attention is drawn in this Report to continued expansion which has raised the estimated net expenditure for the year 1960-61 to £12·2 million, as compared with an actual expenditure of £10·3 million in 1959-60. This expansion, it is stated, has presented considerable administrative problems. The Council stress the importance of ensuring that progress is balanced in relation to national needs—both industrial and academic—and announce a change designed to afford greater flexibility in long-term planning. Instead of following a 5-year plan, the Council will agree with the Treasury each year, subject to the approval of Parliament, (*a*) the expenditure for the following year, (*b*) reasonably firm estimates for the next two years, and (*c*) less definite forecasts for the fourth and fifth years. With this arrangement, estimates can be revised annually.

Attention is also drawn to the increasing response from British universities and colleges of technology to the D.S.I.R.'s offer to provide grants for special researches.

Other sections of the Report are devoted to research stations, research associations, scientific and technical information, and international activities.

EXPORTS OF MACHINERY (other than electric) in the first five months of this year reached a total of £349·7 million as compared with £310·2 million in the corresponding period of 1960.

NEWS OF THE INDUSTRY

Tyneside

GEORGE ANGUS & CO., LTD., Angus House, Westgate Road, Newcastle-on-Tyne, report satisfactory trading in recent months for all departments in the group. The varied products, which include conveyor and transmission belting, industrial hose, fire fighting equipment, and oil seals, are in keen demand from customers in many parts of the world, and we are informed that the total export quota of the Group represents approximately 30 per cent of output.

The Gear Division, with works at Hebburn-on-Tyne, produces Gamax geared motor units, and undertakes a large amount of gear cutting work, on a contract basis, for different sections of the engineering industry. This Division is a self-contained manufacturing unit with a well-equipped precision machine shop, gear cutting and grinding section, and heat treatment department, also inspection, design, and development departments.

A section of the works is concerned solely with the production of non-metallic gears, which are made in various materials to the requirements of individual customers. This section has a capacity for gears up to 48 in. diameter by any suitable face width, and a 24-hour breakdown service is maintained.

In the metallic gear works, there is capacity for cutting spur and helical gears and worm-wheels up to 9 ft. diameter, for grinding worms up to 10 in. diameter by 2¼-in. c.p., and for cutting bevel gears from 3 to 60 in. diameter, also Coniflex types.

The Division has facilities for designing and producing geared units to suit customers' requirements, and such units are also made to designs and specifications supplied.

Machines and equipment recently installed in the works of the company's Gear Division include a Richards PRT type No. 5 horizontal boring and milling machine with Hilger & Watts illuminated optical measuring equipment for all traverses; a 90-in. capacity Pfauter gear hobber; a Pfauter universal gear hobber with a capacity of 36 in. diameter by 16 in. face width, equipped with a crowning attachment; a Churchill Red-Ring 24 in. capacity gear shaving machine; and Gleason 104 and 24 A straight bevel Coniflex gear generators with capacities up to 8 in. and 36 in. diameter respectively. An addition to the plant in the tool room where the company makes gear hobs for use in the production departments is a Menziken-Suisse 8-in. centre lathe, which admits 4 ft. between the centres, and is equipped with a hob relieving attachment, a hydro-electric copying unit, and grinding equipment. Among new items of equipment pro-

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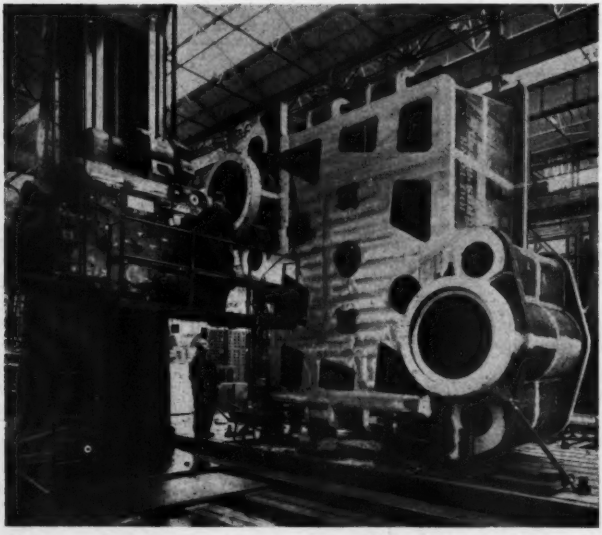
Designed by Davy and United Engineering Company, Limited, at Sheffield, this 100-ton fixed cross-head for a 3,000-ton draw-down type forging press was fabricated by Ashmore, Benson, Pease & Co., Ltd., at Stockton. It was then returned, for machining, to the Darnall, Sheffield, works of Davy-United, where this photograph was taken



vided in the inspection section may be mentioned a Goulder No. 4 rolling gear tester, a Goulder bench type lead tester, a Sigma length measuring machine, and a Taylor-Hobson Orcutt involute measuring machine.

The Division has recently developed a steplessly variable speed, reversing, hydraulic motor unit for trawling winches, which is being made in three sizes of 25, 75, and 150 h.p.

ADAMS POWEL EQUIPMENT, LTD., Kingsway, Team Valley, Gateshead-on-Tyne, report a continued heavy demand for their range of food, bottle, can, and case packing and labelling equipment, also a steady call for concrete tile manufacturing machinery. Work in progress includes electro-pneumatic automatic packing machinery of various types, and a regular output of parking meters is being maintained, the majority of which are destined for export to various Continental countries.

VICKERS ARMSTRONGS (ENGINEERS), LTD. Elswick-on-Tyne, are experiencing a continued demand for both mechanical and hydraulic British Clearing (Rockwell Machine Tool Co., Ltd.) presses.

Various contracts are also in hand for building large rotary type printing machines, and preparations are being made for the construction of steel works equipment for the Tinsley Park project of English Steel Corporation, Ltd.

A steady flow of orders is being booked for ships' deck equipment including hydraulic cranes and winches, also for steering gear for small vessels.

The fabrication department is busy with a variety of work, including a large amount of stainless steel fabrication which is being carried out for chemical plants.

We are informed that a certain amount of capacity is available in the machine shops at the Elswick Works for the production of medium/heavy components on a contract basis.

R. SUTCLIFFE.

The South

ENGIS, LTD., Gabriel's Hill, Maidstone, Kent, continue to be busy with orders for Hyprez flat lapping machines, which employ cast iron lapping plates with diamond compound. Supplementary polishing discs are fitted to the lapping plates when mirror finishing is required. There is a sustained demand for Abradisc abrasive discs, which are attached to flexible holders, of various diameters, designed to be fitted to portable power tools and used for descaling, removing tool marks and imperfections from finished parts, smoothing weld beads, and deburring gear teeth, for example. A recent development in this field is the Abracap method of grinding and polishing, whereby rough surfaces are smoothed by open-, dome-, or conical-ended abrasive-coated sleeves. These sleeves are mounted on, and rotated by, mating resilient rubber holders, driven by flexible shafting, at speeds up to 18,000 r.p.m. according to size of cap.

Interest is reported in Engis-Vonnegut brush-backed abrasive heads for contour finishing. Strips of abrasive-coated material are fed intermittently by hand, or progressively under automatic control in certain types, from a coil in the enclosed hub, through radial slots interposed between the brushes on the circumference of the finishing head, to make contact with the contoured surface of the workpiece. The bristles of the brushes yield under slight pressure to conform to the contour of the part being polished, and thus hold the separate finger-like strips of abrasive material in contact with the work surface.

During the past year, Engis, Ltd., have introduced a range of expanding internal and external laps with helical slots, and effective diameters ranging from $\frac{1}{8}$ to 1 in., for the production of surface finishes of 1 micro-inch and less, using Hyprez diamond lapping compound.

DIAGRIT DIAMOND TOOLS, LTD., Staplehurst, Kent, have a very satisfactory order book for diamond tools, and especially for metal-bonded and resin-bonded diamond impregnated wheels. The ES type diamond wheel, employed largely for the off-hand grinding of tungsten-carbide tipped tools, is stated to be selling well, and there is a good call for honing sticks and diamond points for internal grinding operations. The company's products are being exported to various European countries including Sweden and Italy, and a representative selection of electroplated diamond wheels was included among the exhibits at the British Trade Fair in Moscow.

DIAGRIT GRINDING CO., LTD., Staplehurst, Kent, have recently installed additional machine tools, including a Jones & Shipman 1011 P surface grinder, to provide increased production facilities to meet a steady increase in demand. The company is concerned principally with the manufacture of wear-resisting parts and a wide variety of tungsten carbide tipped reamers, cutters, and form tools.

KENT ALLOYS, LTD., Temple Manor Works, Rochester, Kent, have been established since 1939, and are engaged in the production of a wide variety of castings in iron, magnesium, copper and aluminium. Weights of aluminium castings, which

are supplied for aircraft, nuclear energy applications, and guided weapons, for example, range from a few ounces up to 300 lb. For magnesium the finished weight of castings does not normally exceed 180 lb., and for bronzes, the upper limit, at present, is 20 cwt. In the iron foundry, castings up to 30 lb. weight, conforming to B.S. 1452 Grade 14, are handled on a pallet conveyor. Larger castings up to 8 cwt. are floor moulded.

Various processes are employed in the different foundries, including gravity die casting and shell moulding. Certain cores and moulds are made by the CO_2 technique, and plaster is sometimes employed where finely textured surfaces are required. It may be noted that the services include piped CO_2 which is distributed to the foundries from a bulk supply.

Comprehensive facilities are provided for low temperature precipitation or ageing and high temperature solution and quench treatments of aluminium and magnesium alloy castings. Treatments are frequently of 12 hours' duration or more and are carried out in electric, forced-air, pit-type furnaces. Another process undertaken is fluoride-anodizing of magnesium castings to provide corrosion-resistant surfaces.

Castings may be fully- or partly-machined, as required, and arrangements can also be made for machining, assembling, painting and crating. Separate departments are provided for prototype work, light machining, including repetition work, heavy machining, and assembly. Facilities are available for X- and Gamma-ray examination of castings up to a maximum thickness of 12 in. for light alloys and 6 in. for ferrous materials.

Porous castings, rejected after examination, are reclaimed in certain circumstances by a process of impregnation in which the cavities are filled with phenolic resin.

F. W. HERRIDGE.

I.C.F.C. Sixteenth Annual Report

In presenting the 16th annual report of the Industrial and Commercial Finance Corporation, Ltd., 7 Drapers' Gardens, London, E.C.2, Lord Piercy, the chairman, announced that at £9·5 million, the volume of new business transacted for the year 1960-61 was a record.

During the year, 599 first applications for loans were received (against 392 in the previous year) and facilities were provided in 243 instances (against 144 previously). On March 31, 1961, there were 694 accounts on the books compared with 660 a year earlier.

In an appraisal of the current economic background, Lord Piercy pointed out that the year under review was a period of credit restriction. New hire purchase restrictions were introduced in April, 1960. They were relaxed in January, 1961, but in general no great effect from this relaxation was evident up to the end of the financial year. The level of manufacturing output remained virtually unchanged throughout the period and merchandise exports fell.

Against this industrial background, gross fixed investment in the private sector of the economy, according to the Treasury Bulletin for Industry, was definitely rising over the first three quarters of 1960. The prospect of a continued rise in 1961 afforded a welcome change in a picture which was by no means favourable by comparison with what was happening in other countries.

On the subject of investment allowances, Lord Piercy said that it would be a step forward if the whole question of depreciation and the writing-off of capital expenditure could be studied afresh, with the object of facilitating the modernization of all types of capital equipment. Other countries had given a lead in this matter, to the extent, in some instances, of permitting an optional write-off of capital expenditure for tax purposes. Such a measure meant some loss of revenue in the short run, but none over a long period.

Growth was a leading topic of current economic discussion. The obvious solution of this problem for the United Kingdom lay in increased exports, and the Corporation had been able to assist firms to achieve the type of success in export markets which this country needed. Lord Piercy drew attention to a supplement to the report which makes reference to the accomplishments of some of these firms such as Joshua Bigwood & Son, Ltd., Wolverhampton, whose export trade accounts for some 60 per cent of turnover.

The Corporation provide financial facilities to the machine tool industry on an appreciable scale, and in this connection it may be noted that the amount outstanding at March 31, 1961, was about £1,416,000.

New Leeds Premises of Alfred Herbert

New offices and showrooms, situated at 311 Dewsbury Road, Leeds, of Alfred Herbert, Ltd., Coventry, will be formally opened on July 3, and, in conjunction with the premises which were established in Manchester in 1956, will provide extensive facilities in the North of England for the consultant engineering services made available by the company, and for the distribution of products from their wide range. The existing premises situated at Oak House, Balm Walk, Leeds, will be closed.

To mark the opening, demonstrations of about 100 machine tools will be staged in the showroom from July 4 to 15. In addition to Herbert capstan and combination turret lathes, a large-capacity Richards boring machine, a Keller tracer-controlled milling machine, and injection moulding and sheet metal working machines will be shown in operation, as representative of the extensive range handled by the Factored Division of the company.

The showroom has a floor area of 14,000 sq. ft., and overhead electric cranes of 5 and 15 tons capacity have been installed at a height of 17 ft. 6 in. above the floor to enable machine tools up to fairly large sizes to be readily handled. Following the demonstration, machine tools installed in the showroom will be changed periodically, to give visitors an opportunity of seeing different types from the Herbert range. Tool grinding and lapping machines will be installed in part of the showroom, and sharpening of cutting tools of most types, with the exception of form tools, will be undertaken for customer firms. A 3-phase supply up to a maximum of 300 kVA, for operating machine tools, is derived from a transformer installed in a sub-station on the premises, and compressed air supply lines are fitted with plug-in type connecting pieces.

Fig. 2. In this view may be seen part of the warehouse, in which comprehensive stocks of small tools, items of machine shop equipment, and spare parts for machine tools will be maintained

Fig. 1. A view of the new Leeds premises of Alfred Herbert, Ltd., which will be formally opened on July 3

Comprehensive stocks of small tools, Norton abrasive products, and other items of machine shop equipment, also spare parts for machine tools, will be maintained in an adjoining warehouse, which has a floor area of 4,000 sq. ft. and has been fitted with shelving with a total length of 5,000 ft. A view of the new premises is given in Fig. 1, and of part of the warehouse in Fig. 2.

The staff at the Leeds premises will number about 40, and Mr. S. Hipwell, who joined the company 32 years ago, will be in charge.

500th British-built "American" Broaching Machine

The 500th American hydraulic broaching machine to be built by Coventry Gauge & Tool Co., Ltd., Fletchamstead Highway, Coventry, under licence from the Sundstrand Machine Tool Co., Rockford, Ill., U.S.A., was handed over to Ford Motor Co., Ltd., on June 22.

The machine was received on behalf of the company by Mr. J. Atherton, the Manager—Assets and Maintenance Department, Central Purchasing, who is seen at the right in the accompanying illustration examining the machine, in the company of Sir Stanley Harley, chairman of Coventry Gauge & Tool Co., Ltd., and Mr. Bruce Olson (left), president of Sundstrand Machine Tool Co.

Of T-8-24 type, the 3-way vertical broaching machine will be used for simultaneously cutting four notches in rocker shafts for Ford 105E (Anglia) engines. It has been supplied complete with work-fixture and broaches made by the broach manufacturing division of Coventry Gauge & Tool Co., Ltd., at Ratby, Leics. Other machines in the British-built American range include horizontal and vertical types with strokes up to 66 in.

Mr. J. Atherton, Ford Motor Co., Ltd., (right), Sir Stanley Harley, Coventry Gauge & Tool Co., Ltd. (centre) and Mr. Bruce Olson, Sundstrand Machine Tool Co., U.S.A. (left), at the official handing over of the 500th British-built "American" broaching machine

In a brief speech following the handing-over ceremony, Sir Stanley Harley said that the occasion was a milestone in the growth of his company, and the associated, Rockwell Machine Tool Co., Ltd., the selling agents for Sundstrand machines. He was glad that this machine was to be used by Ford Motor Co., since they had been the largest purchasers of these machines. Sir Stanley pointed out that his company's association with the Ford organization was of very long standing and stemmed from the days of his father, Sir Harry Harley, who had been associated with Mr. Olson's father. As a memento of the occasion, Sir Stanley presented Mr. Olson and Mr. Atherton with models of the broaching machine in Warwickshire oak.

In thanking Sir Stanley, Mr. Atherton pointed out that Ford Motor Co., Ltd., had 110 British-built American broaching machines, and that there were another 23 on order. He took the opportunity to express the gratitude of his company to the Coventry Gauge & Tool Co., Ltd., for their help in meeting urgent requirements for machines, tools and gauges.

New Companies Registered*

HELIOT MACHINE TOOLS, LTD., 35 Greenwich Church Street, London, S.E.10. Registered June 7, 1961. Nom. cap.: £10,000 in £1 shares. Directors: Wm. E. Heliot and Wm. D. Heliot.

SYDMAN (MACHINE TOOLS), LTD., Oozells Street, Birmingham, 1. Registered June 9, 1961. Nom. cap.: £5,000 in £1 shares. Directors: S. Chatham, N. L. Pollard and J. H. Kartz.

* From the lists compiled by Jordan & Sons, Ltd., Company Registration Agents, 116-118 Chancery Lane, London, W.C.2.

Trade Publications

ADAPTASTRUCT DIVISION, DAIDY ENGINEERING CO., LTD. Empress Street, Cornbrook, Manchester, 16. Folder describing Adaptastruct, which comprises frame rods, joints, panels, and panel pins, which permit rapid assembly of structures for display and similar purposes. Panels of both standard and special types are available, and there is a wide choice of colours.

C. A. NORGREN, LTD., Shipston-on-Stour, Warwicks. Brochure describing nine types of precision pressure regulators, including designs for air, non-corrosive gases, and liquids, in pipe sizes from ¼ to 1 in. Also, leaflets concerned with five types of relief valves, with instructions for installation, operation, and maintenance. Another leaflet covers various accessories for regulators, relief valves, filters and lubricators. A new price list is available, also a leaflet giving useful engineering information on compressed air.

Opportunities in Western Australia

Following a visit to Western Australia last year by a team of nine industrialists led by Mr. J. O. Knowles, an informative report on opportunities for industrial investment in that country has been issued. Sections are devoted to geography and areas visited; general industrial development; further industrial possibilities; and industrial participation. In addition there are appendices concerned, for example, with labour, transport and communications, business organization and company law, taxation, and external trade.

Sir Russell Dumas, C.M.G., is now in this country as a member of an advisory committee on industrial development to the Western Australian Government, and will be pleased to supply any further information that may be required. He may be contacted through the office of the Agent General for Western Australia, Savoy House, 115 Strand, London, W.C.2.

Sparcatron and Sparkard Demonstration

Stedall Machine Tool Co., 192-204 Pentonville Road, Kings Cross, London, N.1, inform us that they have been appointed distributors of Sparcatron spark erosion machines and Sparkard tungsten carbide impregnation process machines. These machines will be demonstrated at the above address from July 3-7 (10 a.m. to 4 p.m. daily) and all engineers interested are cordially invited.

Wear Resistant Surfaces for the Bores of Die Cast Aluminium Engine Cylinders

(*Continued from page* 1451)

of the spraying operation, and good lubricant retention properties can thus be obtained.

It is reported that very severe tests have been applied and have shown that the strength of the bond between the cast cylinder and the coating is entirely adequate, and that separation will not occur even under the most adverse conditions. The exact procedure to be followed is not explained in the paper, but it is stated that although the method is "a combination of a spraying and die casting operation carefully tuned into each other at accurate cycle time and closely controlled temperature, it lends itself quite well to complete automation." Dr. Bauer also indicated that a pilot plant and production facilities which were being provided included an automatic lathe for applying the sprayed coatings to the cores, and mentioned that local variations of coating thickness could be obtained, if required, under electronic control.

The transplant coat process is likely to prove of the greatest value in connection with aluminium cylinders, but there appears to be no reason why it should not find application to many other types of die castings, to provide improved wear resistance in bores and on other surface areas.

MACHINERY'S ENQUIRY BUREAU

For many years MACHINERY has provided an enquiry service not only for subscribers and advertisers but for all engineers in need of such information as the names of makers—or their agents—of machines or equipment for performing particular operations, suppliers of various classes of material, firms with facilities for undertaking certain types of work, owners of trade names, and agents for foreign machine builders. If you have such a problem write (MACHINERY, Enquiry Bureau, Clifton House, 83-117 Euston Road, London, N.W.1) or telephone (Euston 8441, 2 lines). This service is, of course, entirely free.

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28/6/61

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That it shall not, without the written consent of the publishers first given, be lent, resold, hired out or otherwise disposed of by way of trade except at the full retail price of 1s. 3d. and, that it shall not be lent, resold, hired out or otherwise disposed of in a mutilated condition or in an unauthorised cover by way of trade; or affixed to or as part of any publication or advertising literary or pictorial matter whatsoever.

I.Prod.E. Officers Elected

The Council of the Institution of Production Engineers, 10 Chesterfield Street, Mayfair, London, W.1, has announced the election of the following principal officers for 1961-62.

PRESIDENT—Mr. Harold Burke, M.I.Mech.E., M.I.Prod.E., deputy chairman and joint managing director of Concentric, Ltd., chairman and managing director of Concentric (Engineering), Ltd., chairman of Fletcher Bros. (Pressings), Ltd., and a director of the other Concentric subsidiary companies. He is a past Hon. Sec. and past Chairman of the Birmingham Section of the Institution, has been a member of the Council of the Institution since 1948, and has held the offices of Chairman and Vice-Chairman.

VICE-PRESIDENT—Mr. R. Ratcliffe, C.B., M.B.E., M.I.Mech.E., M.I.Prod.E., Controller of the Royal Ordnance Factories.

CHAIRMAN OF COUNCIL—Mr. R. H. S. Turner, M.A. (Cantab.), M.I.Prod.E., director and works manager, Associated Electrical Industries (Manchester), Ltd. (re-elected for second term).

VICE-CHAIRMAN OF COUNCIL—Mr. A. L. Stuchbery, M.I.Mech.E., M.I.Prod.E., chief technical engineer, The Metal Box Co., Ltd. (re-elected).

Obituary

MR. GEORGE H. ALEXANDER. We regret to record the death, on June 17, in his 96th year, of Mr. George Henry Alexander, founder and director of George H. Alexander Machinery, Ltd., 82-84 Coleshill Street, Birmingham, 4.

Born in the Isle of Wight, he went to Birmingham at the age of 15 and obtained employment in a manufacturing organization in Summer Lane, where he was first engaged in secretarial work. Later he became assistant to the works manager and in this capacity gained his early engineering experience. Subsequently, after holding various positions in industry, he joined the Goodyear Company of America in connection with a special patent mission concerned with pneumatic tyres. After successfully completing this work, he was invited to visit the U.S.A. as the guest of the company, and was there introduced to the principals of some leading American machine tool firms.

Mr. Alexander then returned to England to take a part in the growing machine tool industry. He became technical representative for Pratt & Whitney for whom Buck & Hickman, Ltd., were agents, and in 1896 he founded his own business in special-purpose machine tools, which has since become widely known both in this country and overseas.

After surviving a difficult period in the depression following the Boer War, the business began to prosper as a result of his knowledge of machinery and sound judgement, and he co-operated in the introduction of modern methods and equipment in the works of many companies.

Mr. G. H. Alexander

During the first world war he visited the U.S.A. on a buying mission for the Government and was concerned with the equipment of armament factories. As a result of the strain of this work he retired temporarily to Everton, Hampshire, where he met a Mr. Gray and a Mr. John Howlett. The former was the inventor of the process for stressing piston rings to obtain uniform radial pressure, and this chance meeting led to the formation of Wellworthy Piston Rings, Ltd. Mr. Alexander financed the venture and advised the management, and was an active director of the rapidly growing business until he retired from the board in 1946 on his 80th birthday.

He continued to hold the positions of chairman and managing director of his own company up to the age of 91, and in 1956 he was present daily at Olympia, from 9.30 a.m. to 6 p.m., throughout the period of the International Machine Tool Exhibition.

He leaves a daughter and three sons.

MR. JOHN H. NEAL. It is with regret that we announce the death of Mr. John H. Neal on June 21, at the Royal Masonic Hospital, at the age of 81. He was formerly an assistant director of Buck & Hickman, Ltd., 2 Whitechapel Road, London, E.1.

New Appointments

The following new appointments have been announced:—

MR. C. R. ARNOLD as sales director of George Vokes (Infra Red), Ltd., Infra Red Works, High Road, New Southgate, London, N.11. He has been a member of the technical staff of the Vokes Group for more than 10 years.

MR. K. J. BUSH, A.M.I.E.E., as assistant sales manager, Cambridge Instrument Co., Ltd., Mechanical Thermometer Division, Friern Park, North Finchley, London, N.12 and MR. W. C. ORFORD, MR. S. V. J. CRUMP, and MR. W. A. HALL, as assistant resident engineers at the company's branch offices in Nottingham, Bristol, and Manchester, respectively.

MR. R. P. MOORE, as representative for the South London area and the southern counties, and MR. R. LAPISH, as representative for the East Anglia area, including Stamford, Wellingborough and Stevenage, of Pye, Ltd., Process Heating Division, 28 James Street, Cambridge. MR. J. J. TYRRELL will continue to represent the company in the North London area and High Wycombe, and Mr. J. A. TAYLOR in the area covering South Wales to Birmingham, as far as the borders of Yorkshire and Lincolnshire.

MR. T. C. LEADBEATER, who was formerly in charge of the Hob Department of Dowding & Doll, Ltd., as planning engineer, MR. J. GREEN, who has seen service in both the works and the drawing office, as estimator, and MR. S. HIGGINS as technical representative in Northern England, with particular responsibility for Yorkshire, Lancashire, and Cheshire, for Aldridge Tool & Engineering Co., Ltd., Aldridge, nr. Walsall, Staffs. Mr. Higgins has succeeded Mr. J. Johnston, who has left the company's employment.

Scrap Metals

MIDLANDS.—Merchants are still clearing basic heavy steel scrap but only one steelworks is now accepting ad-lib deliveries. Other works have partial or complete restrictions, and there is no demand for low sulphur and phosphorus scrap. Grades 1 and 2 heavy steel scrap are arriving from merchants' yards where processing of oversize steel by gas cutting and shearing is proceeding at a steady rate. No. 4 bales are in steady demand and light steel cuttings are required for pressing. In general, light iron scrap is being moved in loose form due to the limited outlets for No. 5 bundles.

Local factories are receiving reduced prices for chipped and bushy turnings due to difficulties in placing this type of scrap, also to the fact that blast furnaces have reduced prices in addition to restricting intake. Since the blast furnaces are taking fewer hydraulically-compressed destructor bales, prices for loose destructor scrap have eased.

In general, cast iron scrap finds a ready sale and prices are steady for all grades. Short heavy steel scrap is more difficult to place due to limited acceptances by the foundries, particularly in respect of the lower quality material.

Stamping flash from drop forgings is being supplied mainly to steelworks. Carbon bar ends, up to 2 ft. in length and not exceeding 0·04 sulphur and phosphorus, are being taken by foundries.

Prices for oversize steel scrap, oversize cast iron scrap and new production light steel cuttings are likely to remain firm while local demand persists, but it is possible that prices for turnings may fall even further between now and August.

High-speed and nickel steels are in demand, subject to test, mainly for supply to works in the Sheffield area.

Industrial Notes

ALCAN INDUSTRIES, LTD., inform us that, as from July 1, 1961, the territory covered by their sales office at 57 Bute Street, Luton, will take in Oxfordshire and the southern portions of Buckinghamshire and Essex, hitherto covered by their London sales office.

BRITISH-BUILT DENISON HYDRAULIC MULTIPRESSES.—The following multipresses are now being built by Denison-Deri, Ltd., Burgess Hill, Sussex: type R, from 1 to 6 tons capacity; type S, from 3 to 8 tons capacity; and type T, from 4 to 12 tons capacity. Sales of these presses are handled by Gaston E. Marbaix, Ltd., Devonshire House, Vicarage Crescent, London, S.W.11.

WILFLO PRODUCTS, Whitefield Works, Field Road, Busby, Glasgow, inform us that they accepted an order on May 29 for a 90-kVA oil-cooled, 3-phase transformer, for 440 volts input and 380 volts output, to be delivered at Brighton, Sussex, on June 5. The transformer, which was required to supply a large tower crane, was completed and delivered by the specified date.

WELTRONIC CO. (CANADA), are setting up an organization for the distribution of Weltronic resistance welding controls in the United Kingdom and the rest of Europe. Mr. C. R. Bates, A.M.I.E.E., A.M.Brit.I.R.E., has been appointed director, sales and service. The address, from which particulars of Weltronic products may be obtained, is 60A Station Road, Solihull, Warwickshire (telephone, Solihull 5276).

CRAVENS (MACHINES), LTD., is the title of a subsidiary which has been formed by John Brown & Co., Ltd., to undertake the machine building activities previously carried on by Cravens, Ltd., at Darnall, Sheffield, 9. Principal products will include plastics injection moulding machines and the full range of H.P.M. presses and Castmaster die casting machines. A close working arrangement is now being established between Bone Brothers, Ltd., and Cravens (Machines), Ltd., and Wickman, Ltd., Coventry, have ceased, by agreement, to act as sales agents for H.P.M. moulding machines. They will, however, continue to handle the sales of H.P.M. Castmaster die casting machines and metal working presses.

ABRASIVE SPECIALITIES, LTD., Park View, Padiham, Nr. Burnley, Lancashire, a comparatively new company in the field of abrasives production, state that there is a satisfactory demand for their extensive range of products, which includes "Waffle" abrasive cutting-off wheels. It is claimed that the special waffle pattern on the sides of these wheels ensures cool cutting properties, which not only reduce tempering of the metal being cut, but also increase the life of the wheels. Small resinoid bonded grinding wheels up to 4 in. diameter, resinoid bonded segments incorporating special ingredients to resist coolant, and depressed centre discs re-inforced with glass fibre for added strength, are also made by the company. In addition, the production of reinforced cutting-off wheels was recently started. A good demand is reported for these discs, mainly for use in foundries for the cutting of gates and risers.

Corrections

In MACHINERY, 98/1321—7/6/61, reference was made to the Murad type EG.8 pedestal grinding machine, and it was stated that special provisions are made to prevent the spread of dust produced during grinding. We have been asked to point out that the machine has centrifugal impellers on the rotor shaft, between the rotor and the grinding wheels, and as the shaft rotates, a vacuum is created in a chamber within the machine base. In consequence, dust-laden air is drawn from the grinding area, and is passed through filters whereby the dust is deposited, and only clean air is discharged to the atmosphere.

In the article "Assessment of Surface Finish by Means of Surface Roughness Scales," the reference to curve B in the caption of Fig. 1 should read as follows: "curve B, to 15 pairs of milled specimens, of which the smoother ones were between 32 and 500 micro-inches." Also at the foot of the right-hand column on p. 1426 the sentence should read: "Most scales are calibrated in increments of 100 per cent (1, 2, 4, 8, 16, 32, 63, 125, 250, and 500 micro-inches CLA) according to B.S. 2634/60; Part 1.

In the advertisement for Gaston E. Marbaix, Ltd., Devonshire House, Vicarage Crescent, London, S.W.11, which appeared on page 79 of MACHINERY for June 21, it was implied that the new Mattison 4 surface grinder would be on show at the forthcoming European Machine Tool Exhibition in Brussels. This machine will not, in fact, be exhibited.

Machine Tool Share Market

Although a steadier trend subsequently developed, conditions in stock markets were unsettled during the period under review, with the volume of business restricted, and prices moving mostly towards lower levels.

The gilt-edged section displayed weakness, and on balance widespread declines were shown among British Government and kindred stocks.

Commercial and industrial share markets were depressed, but moderate activity was resumed after sharp setbacks and the final prices were above the lowest.

Among machine tool issues, British Oxygen advanced 6d. to 21s. 6d.; Coventry Gauge Tool, 3d. to 31s. 10½d.; Newman Industries, 9d. to 7s.; and Tap & Die Corporation 3d. to 17s.

On the other hand, Abwood Machine Tool lost 3d. at 2s. 3d.; Edgar Allen, 1s. 6d. at 42s.; Arnott & Harrison, 6d. at 16s. 6d.; Asquith Machine Tool, 6d. at 10s. 6d.; Birmingham Small Arms, 6d. at 25s. 6d.; Brooke Tool, 3d. at 9s. 10½d.; Clarkson (Engineers), 2s. 6d. at 40s.; Chas. Churchill, 3d. at 8s. 6d.; Geo. Cohen, 1s. 6d. at 12s. 6d.; Craven Bros. (Manchester), 9d. at 9s. 3d.; Greenwood & Batley, 1s. 6d. at 25s.; John Harper, 1½d. at 8s. 4½d.; B. & S. Massey, 1s. at 11s.; Newall Engineering, 6d. at 9s. 6d.; Samuel Osborn, 2s. 6d. at 51s. 3d.; Sanderson Kayser, 3s. 1½d. at 35s. 7½d.; Ambrose Shardlow, 1s. 3d. at 62s. 6d.; Scottish Machine Tool, 2s. 3d. at 10s.; John Shaw & Sons (Wolverhampton), 3d. at 18s. 10½d.; Sheffield Twist Drill, 3d. at 18s. 3d.; W. E. Sykes "B," 1s. 3d. at 30s.; Thos. W. Ward, 2s. 6d. at 78s. 9d.; and Willson Lathes, 4½d. at 3s.

GREENWOOD & BATLEY, LTD.—Final dividend of 10 per cent, making a total distribution of 15 per cent for the year ending March 31, 1961.

Gauge and Tool Makers Handbook

The 8th edition of the Members' Handbook has recently been published by The Gauge and Tool Makers' Association, Standbrook House, Old Bond Street, London, W.1. This useful publication summarizes the aims, objects, and activities of the Association; gives the names, addresses, telephone numbers, and telegraphic addresses of the member firms (which at present number 386); and includes a comprehensive buyers' guide. In addition the names of members of the British Power Press Manufacturers' Association are listed.

Copies are available, free-of-charge, to actual and potential buyers of tools and gauges, on application to the above address.

COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	2/3
Allen (Edgar) & Co., Ltd.	Ord.	£1	42/-
" "	5% Prf.	£1	13/6*
Arnott & Harrison, Ltd.	Ord.	4/-	16/6xd
Asquith Machine Tool Corp., Ltd.	Ord.	5/-	10/6
" " "	6% Cum. Prf.	£1	16/6xd
Birmingham Small Arms Co., Ltd.	Ord.	10/-	25/6xd
" " "	5% Cum. "A" Prf.	£1	14/6
" " "	6% Cum. "B" Prf.	£1	17/-
" " "	4% 1st Mort. Deb.	Stk.	90½
British Oxygen Co., Ltd.	Ord.	5/-	21/6
" " "	6% Cum. Prf.	£1	20/-
Brooke Tool Manufacturing Co., Ltd.	Ord.	5/-	9/10½xd
Broom & Wade, Ltd.	Ord.	5/-	24/9
" "	6% Cum. Prf.	£1	16/6
Brown (David) Corporation, Ltd.	5½% Cum. Prf.	£1	16/-xd
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	17/-
Butler Machine Tool Co., Ltd.	Ord.	5/-	16/3
" " "	5% Cum. Prf.	£1	14/3xd
Churchill (Charles) & Co., Ltd.	Ord.	2/-	8/6
" " "	6% Cum. Prf.	£1	25/4½‡
Clarkson (Engrs.), Ltd.	Ord.	5/-	40/-
Cohen (George), 600 Group, Ltd.	Ord.	5/-	12/6
" " "	4½% Cum. Prf.	£1	12/6
Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	31/10½
" " "	5% Cum. Red. Prf.	£1	16/3
Craven Bros. (Manchester), Ltd.	Ord.	5/-	9/3
Elliott (B.) & Co., Ltd.	Ord.	1/-	4/6
" "	4½% Red. Cum. Prf.	£1	12/-xd
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	11/-
Greenwood & Batley, Ltd.	Ord.	10/-	25/-
Harper (John) & Co., Ltd.	Ord.	5/-	8/4½
" " "	4½% Red. Cum. Prf.	£1	11/7½
Herbert (Alfred), Ltd.	Ord.	£1	72/6
Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	22/6xd
" "	"B" Ord.	5/-	20/6xd
Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	29/-
" " "	7% Cum. Prf.	5/-	4/9xd
Kearney & Trecker-C.V.A., Ltd.	5½% Red. Cum. Prf.	£1	11/-xd
" " "	Prefd. Ord.	£1	13/9xd
Kearns (H. W.) & Co., Ltd.	Ord.	5/-	25/-xd
Kerry's (Gt. Britain), Ltd.	Ord.	5/-	10/7½
Macreadys Metal Co., Ltd.	Ord.	5/-	17/-
Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/6
Massey (B. & S.), Ltd.	Ord.	5/-	11/-
Newall Engineering Co., Ltd.	Ord.	2/-	9/6xd
Newman Industries, Ltd.	Ord.	2/-	7/-
" "	6% Prf. Ord.	5/-	5/-
Noble & Lund, Ltd.	Ord.	2/-	6/-
Norton, W. E. (Holdings), Ltd.	Ord.	2/-	9/-xd
Osborn (Samuel) & Co., Ltd.	Ord.	5/-	51/3
" " "	5½% Cum. Prf.	£1	23/-
Pratt (F.) & Co., Ltd.	Ord.	5/-	18/9
Sanderson Kayser, Ltd.	Ord.	10/-	35 7½xd
" "	6½% Cum. Prf.	£1	16 3xd
Scottish Machine Tool Corporation, Ltd.	Ord.	4/-	10/-
Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	62 6xd
Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	18/10½
Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	18/3xd
" " " "	5% Cum. Prf.	£1	13/9
Stedall & Co., Ltd.	Ord.	5/-	8/3
Sykes (W. E.), Ltd.	"B" non-voting Ord.	10/-	30/-
Tap & Die Corporation, Ltd.	Ord.	5/-	17/-
" " "	4½% Deb. 1961-1977	Stk.	82½
Wadkin, Ltd.	Ord.	10/-	26/-
Ward (Thos. W.), Ltd.	Ord.	£1	78/9
" "	5% Cum. 1st Pref.	£1	13/6xd
" "	5% Cum. 2nd Pref.	£1	21/6xd
Willson Lathes, Ltd.	Ord.	1/-	3/-

The Middle Prices given in the list are in several cases nominal prices only and not actual dealing prices. Every effort is made to ensure accuracy, but no liability can be accepted for any error. * Sheffield price. ‡ Birmingham price.

Extra work holding collets, up to ½in. diameter capacity, fit directly into spindle bore. Optional Extras: 3-jaw 3½ inches diameter precision self-centring, and 4-jaw independent chucks.

Extra equipment is "live" spindle swivelling workhead which plugs in. Features include: rapid changeover from standard, large spindle flange, reversing switch for face grinding, 12 spindle speeds 65 to 670 r.p.m.

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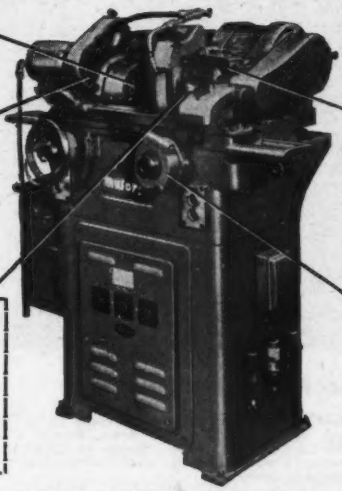

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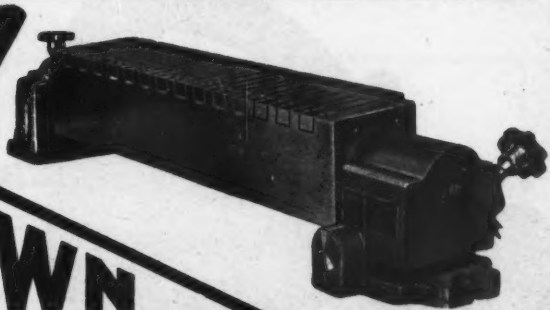

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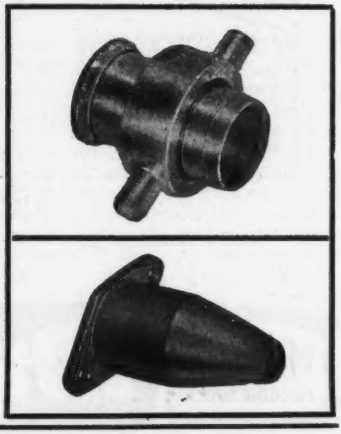

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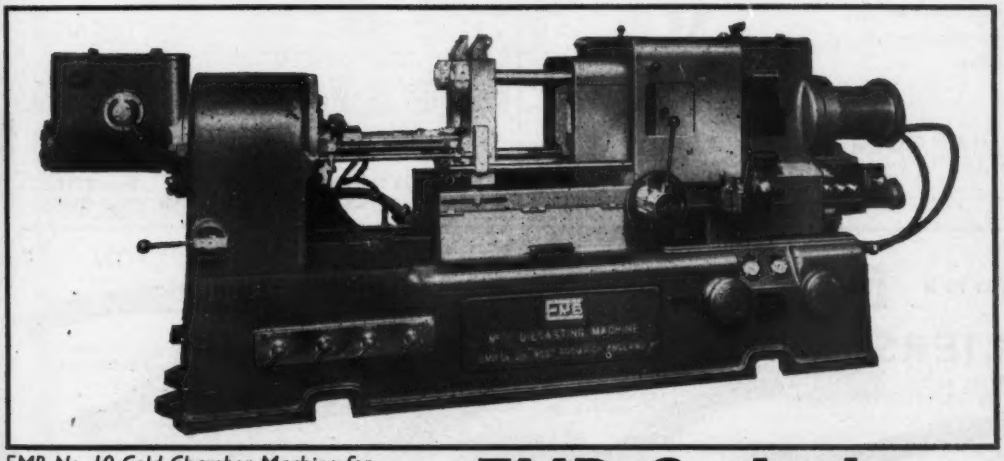

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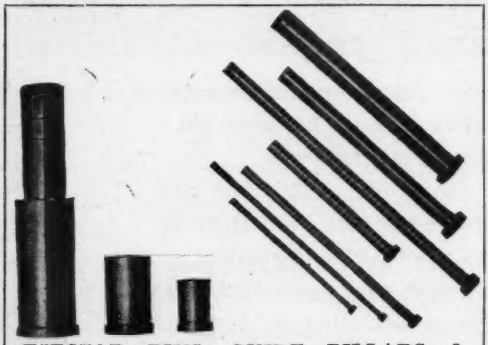

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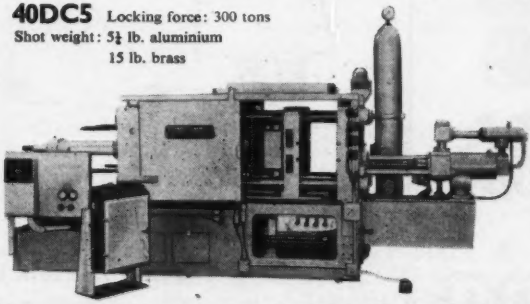
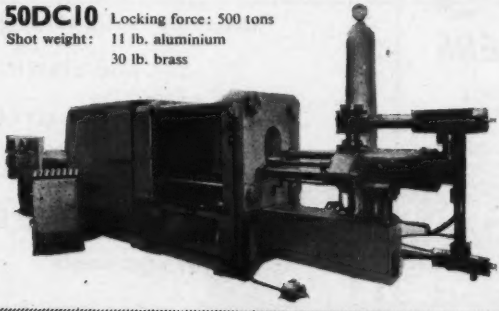
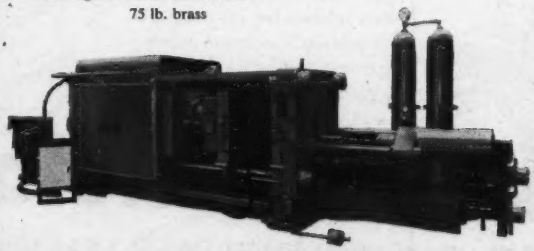


50DC10 Locking force: 500 tons
Shot weight: 11 lb. aluminium
30 lb. brass



60DC20 Locking force: 750 tons
Shot weight: 26 lb. aluminium
75 lb. brass



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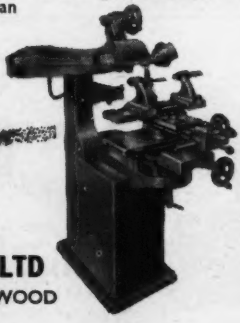

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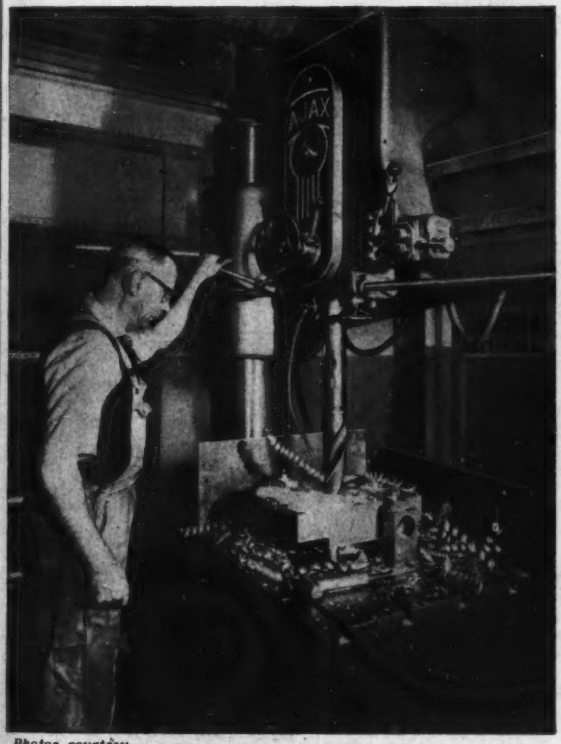

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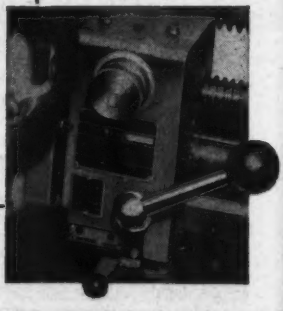

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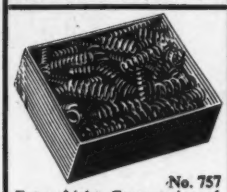

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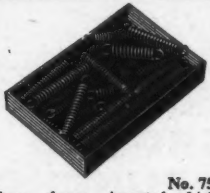

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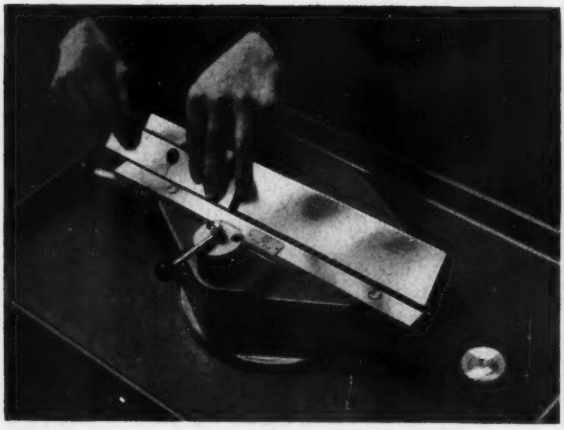

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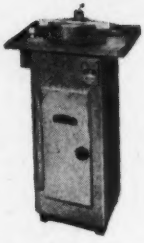

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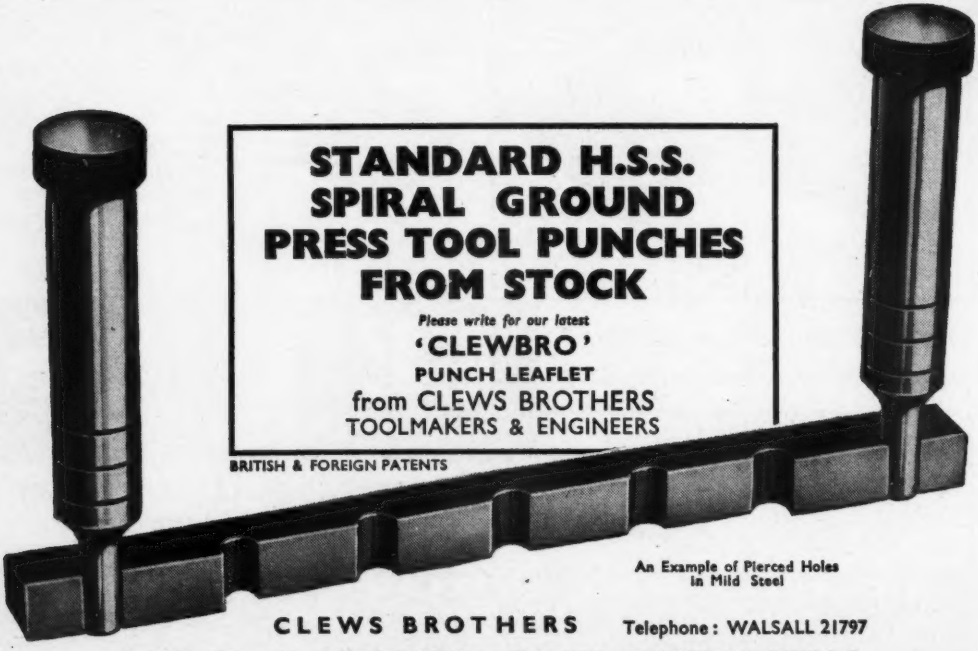

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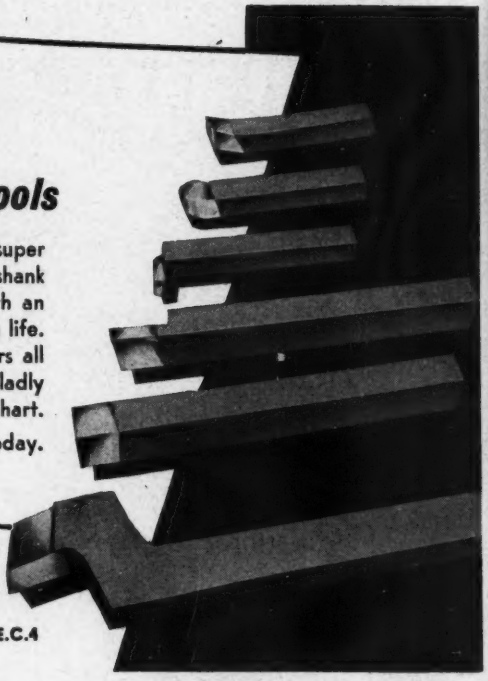

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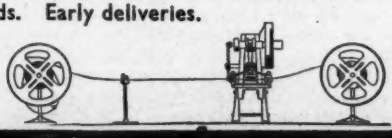

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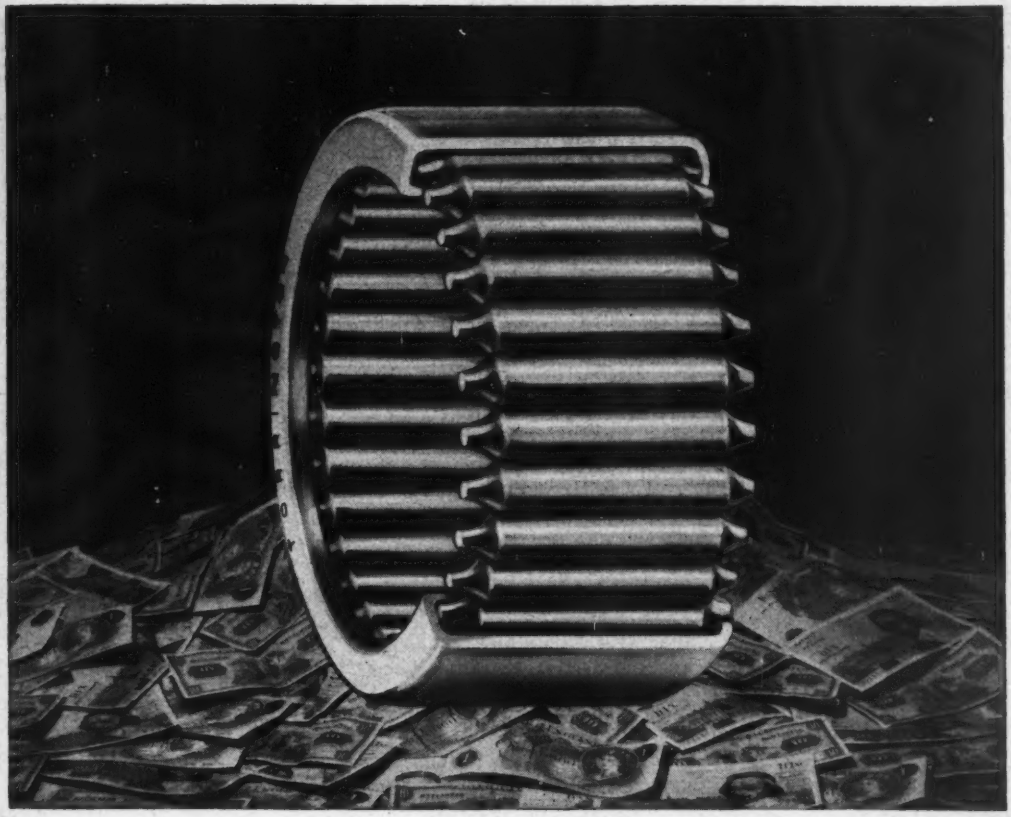

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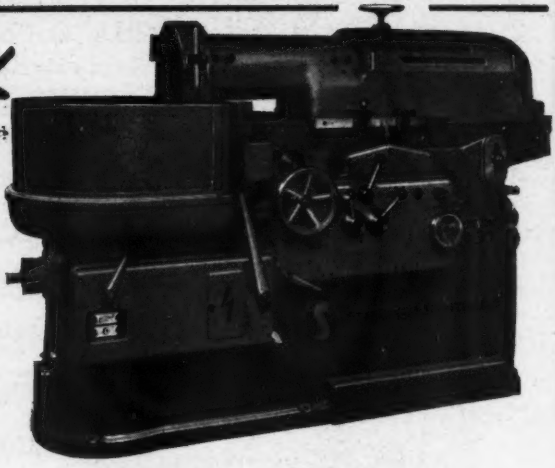

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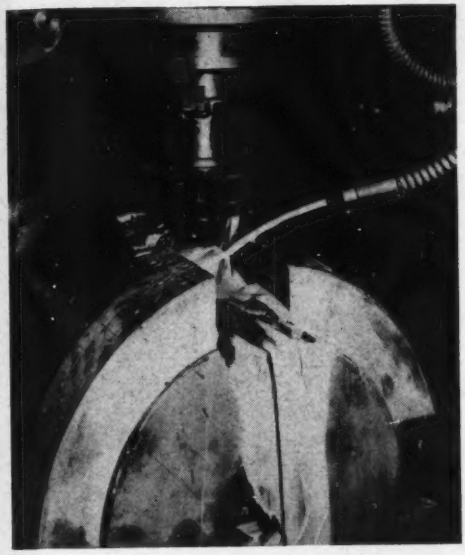

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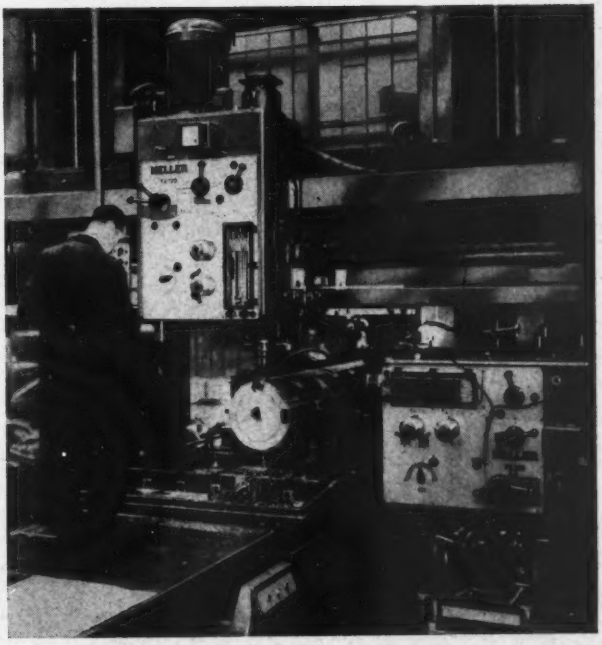

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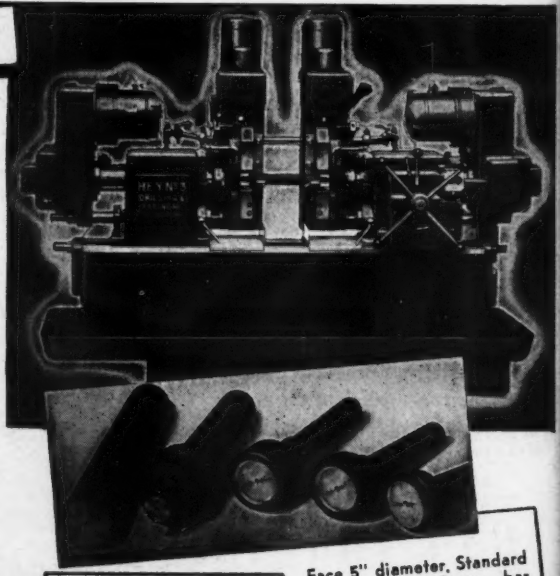

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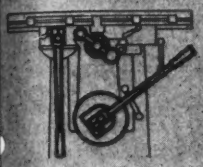
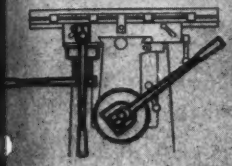
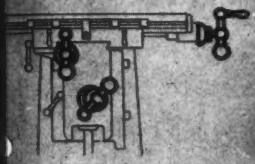


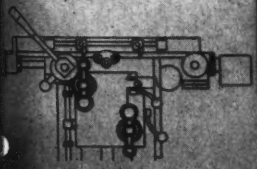
d Feed—lever, screw, lever.



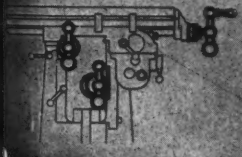
nd Feed—lever, lever, lever.



d Feed—Screw, screw, screw.



iform—semi-automatic cycle.



ormal automatic feed.

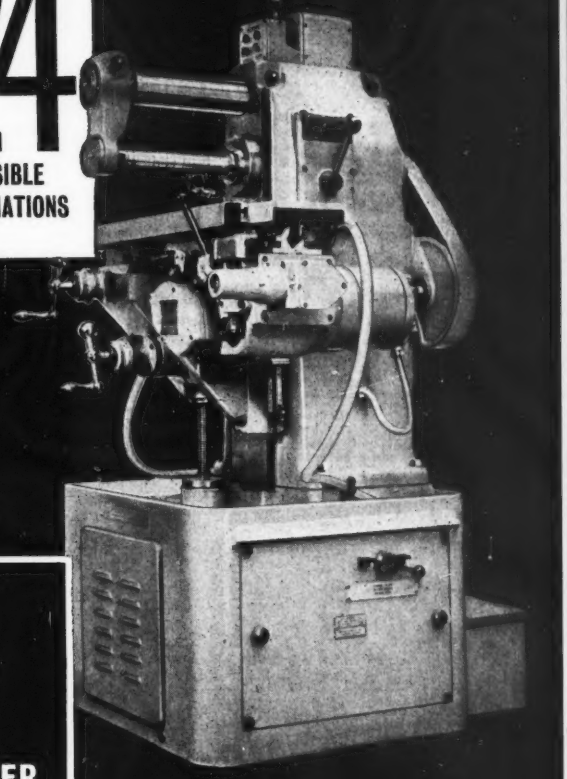
6 x 4 = 24

TYPES OF FEED | SPEED RANGES | POSSIBLE COMBINATIONS

that's the beauty of the

A&S

MODEL '1' HORIZONTAL MILLER



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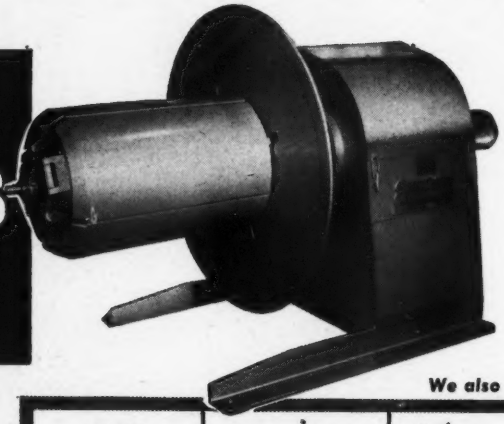

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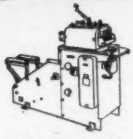

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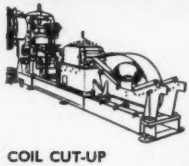

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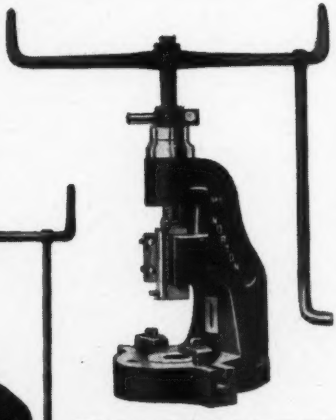

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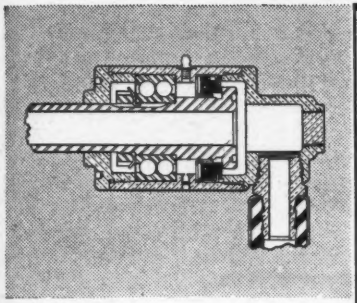
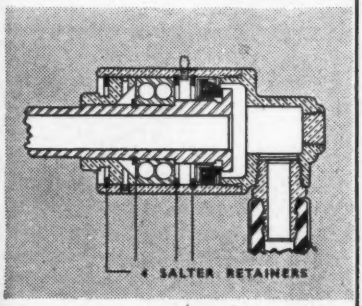


THE OLD WAY Air, water, steam union involved drilling, threading and milling operations. Maintenance was difficult.



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TOTAL SAVING WITH SALTER RETAINERS	8/6½

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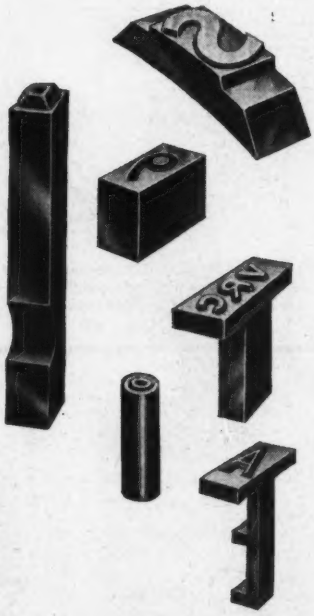

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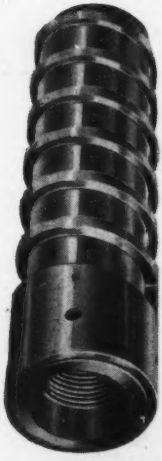

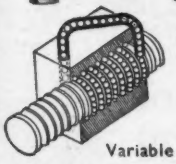

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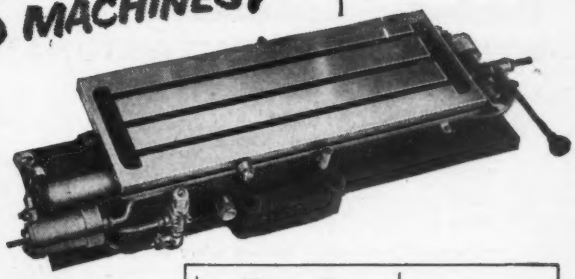

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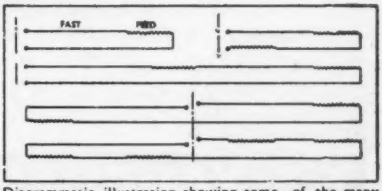

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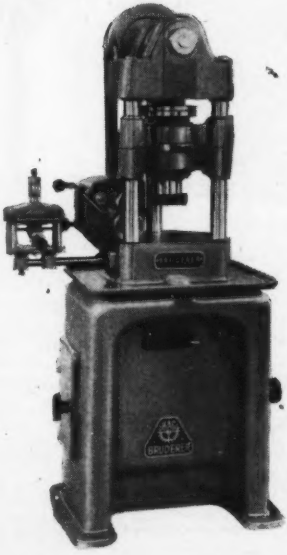

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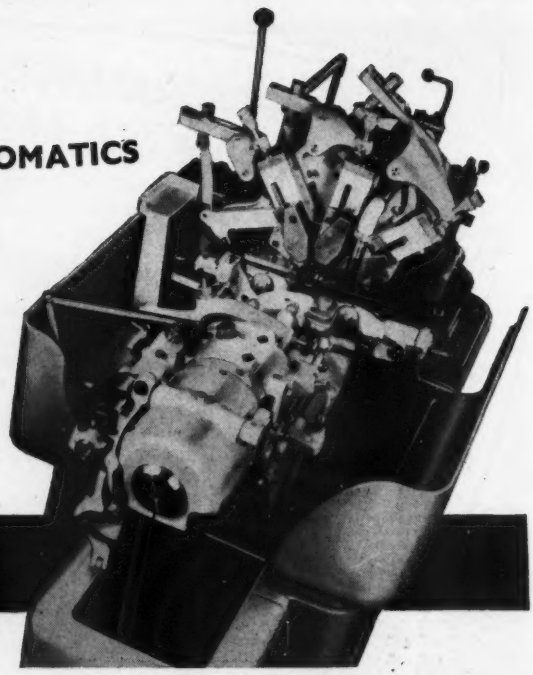

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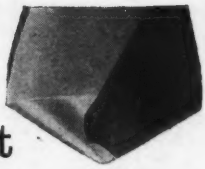

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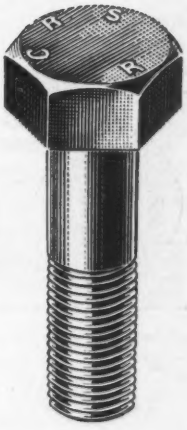

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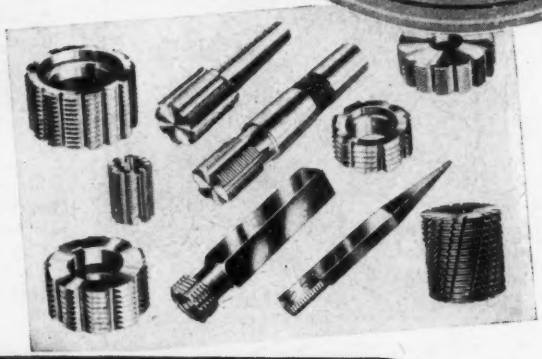

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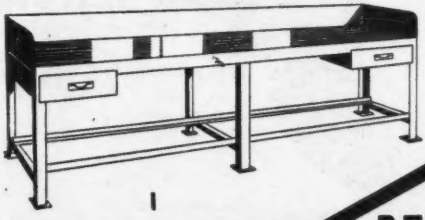
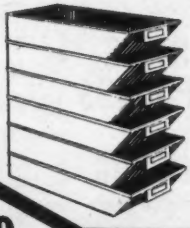


1



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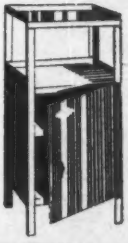

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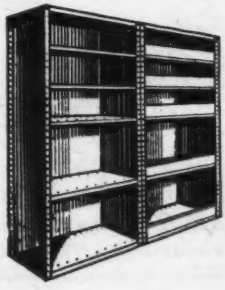

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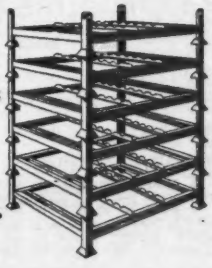

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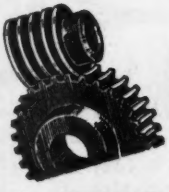

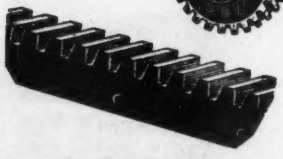

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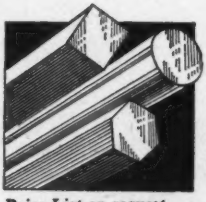

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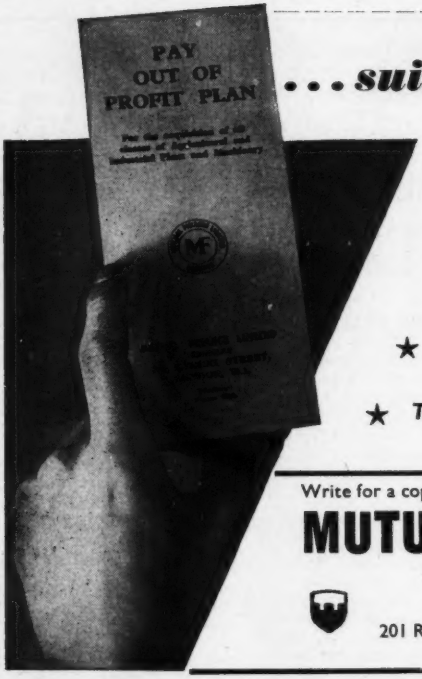

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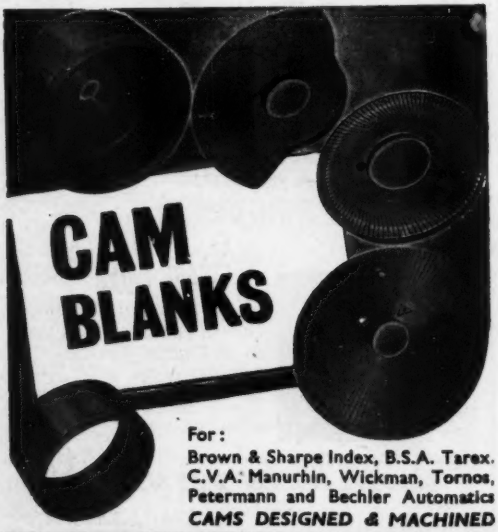

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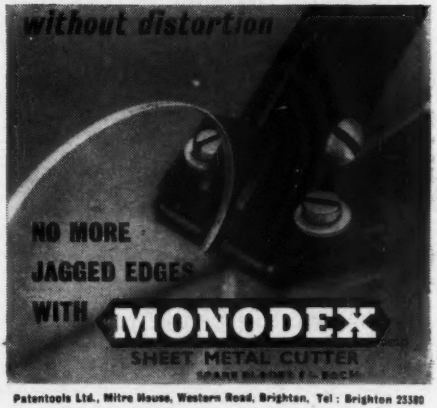

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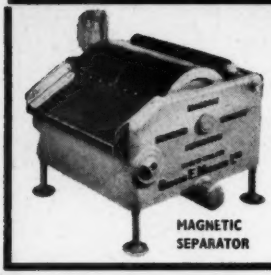

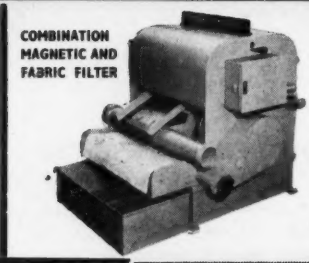

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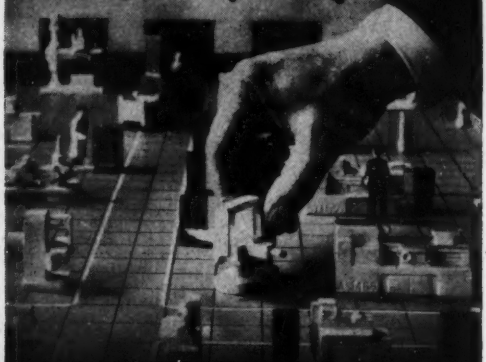

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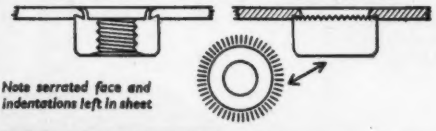

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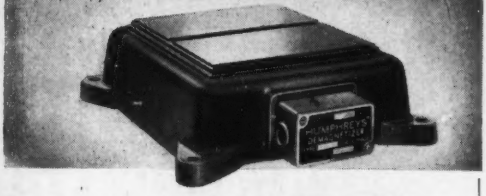

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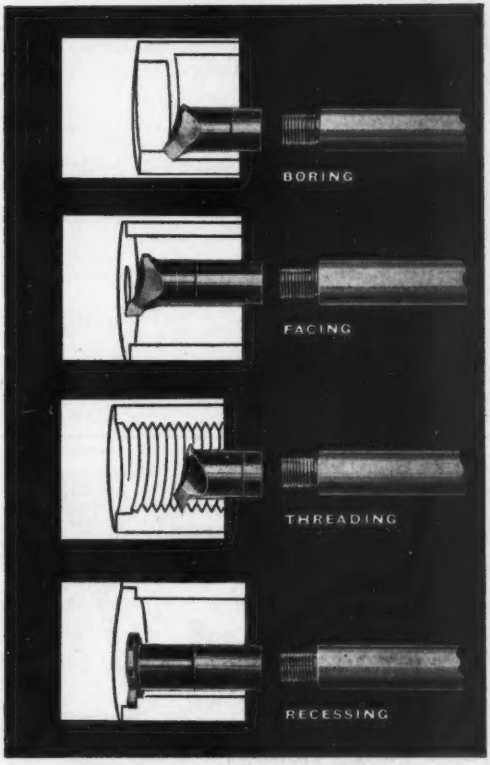

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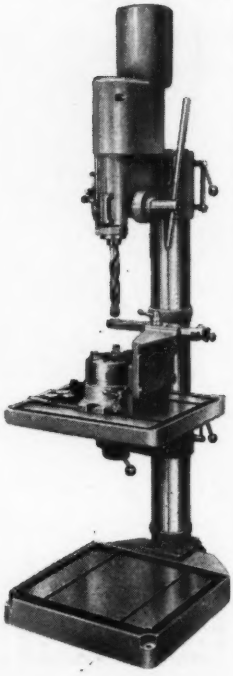

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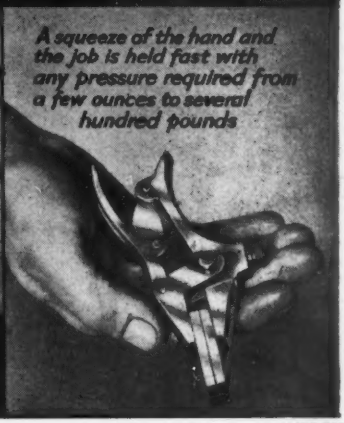

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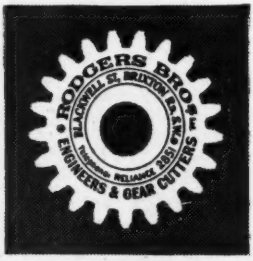

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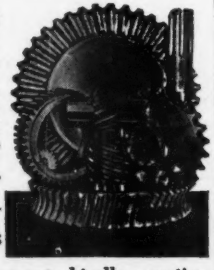

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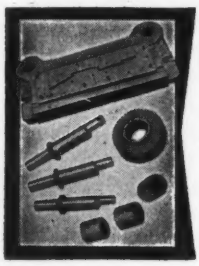

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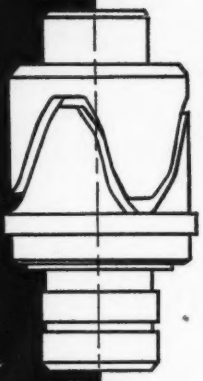

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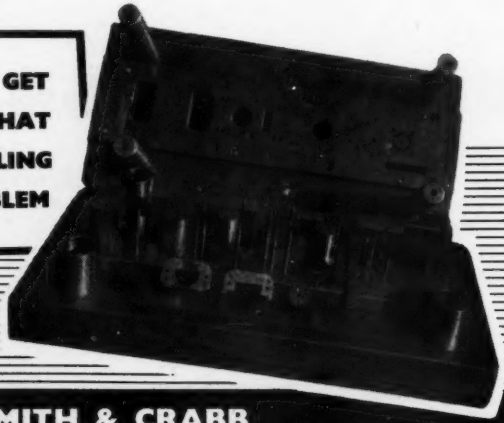

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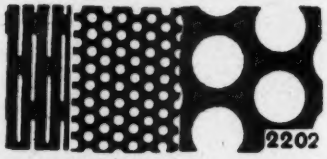

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20 Ton Vaughan 42ft. 3in. span. Unused.
20 Ton Morris Goliath, 35ft. span, 5 ton auxiliary.
10 Ton Heywood, 34ft. span. Unused.
10 Ton Morris, 32ft. 10in. span, cab control.
10 Ton, 60ft. span. 1955. (Two.)
7 Ton, 37ft. span. 1950 (Two.)
5 Ton, 37ft. span. 1944.
3 Ton Morris, 149ft. span. 1954.

FRED WATKINS (ENGINEERING), LTD.,
Coleford, Glos. 'Phone: Coleford 2271 (5 lines).

Adcock & Shipley All-geared

High Speed Milling Machine. 12 speeds to 2,000 r.p.m. Table 37½ × 10. Powered all directions. Built-in motor, etc. Elec. suds. Modern. £450. "Pratt & Whitney" Production Mill. £255.—BOX D53, MACHINERY, Clifton House, Euston Road, N.W.1.

TAYLOR & CHALLEN Model G.D.P. 3½ Double Action Press. 10in. punch stroke, 22in. between columns.

PARKES (MACHINE TOOLS) LTD.,
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HERBERT 46V VERTICAL MILLER
Table 58in. by 15in.; 36in. long. and 13½in. auto cross feed; 16in. Auto Vertical Feed. Speed 25 to 500 r.p.m.

F. J. EDWARDS LTD.,
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Telephone: EUSton 5000 Telex. No. 24264
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41, Water St., Birmingham, 3.
Telephone: Central 7606-8.

G. A. ROBINSON (STOKE-ON-TRENT) LTD.,
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USED AND RECONDITIONED MACHINE TOOLS AT BARGAIN PRICES

SCRIVEN H/D 8ft. × ½in. Plate Guillotine.
PALLAS Universal Miller, U2, 40in. × 10in. All Geared, Power Traverse All Round.
SAGAR (New) Wood Turning Lathes, Full Equipment. (**HALF NEW PRICE.**)
CINCINNATI No. 4, Plain Power Feeds, Dial type, Spindle speeds, 18/1,300 r.p.m.
HERBERT 2-spindle, All Geared Head on 3-spindle Pedestal Base, Table 36in. × 15in. fitted No. 3 Quick Change Chucks. Spindle speeds 104-562.
RHODES Press Brake, 8ft. × ½in., Motorised, Undercranked.
RHODES Guillotine, 8ft. × ½in., Motorised.
RHODES Press Brake, 5ft. × ½in., Single Pulley Drive.
RHODES Press Brake, 4ft. × ½in., Single Pulley Drive.
RHODES Press Brake, 10ft. × ½in., Undercranked, Motorised.
RHODES Press Brake, 4ft. × ½in., Single Pulley.
BESCO 75 ton D/sided Inclinable, 4½in. stroke, motorised, fitted with Udal Guards, Platen 27in. × 27in.
CINCINNATI No. 4 Vertical Miller, 1,300 r.p.m.
CINCINNATI 1/18 Manufacturing Miller, 1,500 r.p.m., with Backlash Eliminator.
MILWAUKEE No. 4, Horizontal, 1,000 r.p.m.
CINCINNATI Plain Grinder, 10in. × 36in., Model ER (As New).
HERBERT No. 1 Capstan Lathe.
REED PRENTICE Toolroom Lathe, 10in. Centres × 7ft. in. Between Centres.
ARCHDALE 20in. Horizontal Miller, Dial Type Feeds and Speeds, 615 r.p.m.
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CLIFTON & BAIRD Hydraulic Coldsaw. 24in. × 8in. square.
LUMSDEN 4-wheel Tool Grinder.
TOWN Radial Drilling and Tapping Machine, 6ft. Arm Rise and Fall, Tee Slotted, Low Base, No. 5 Morse Taper.
RICHMOND O.3 Plain Miller.
STANLEY 11in. Heavy Duty Lathe.
STANLEY 7in. Centre Lathe.
ARCHDALE Column Drill, Compound Table, No. 5 Morse.
COVELL Hydraulic Surface Grinder, 24in. × 8in.
ROWLAND 16in. D/E Pedestal Grinder. H.D.
B.G. Power Hacksaw, 8in.
B.O.C. Profile Cutter.
2 off **GLEASON** Spiral Gear Roughing and Finishing Cutters, 12in. (Excellent condition.)
SMART & BROWN Toolroom Lathe, 4in. × 18in. b.c. Full equipment, collets and attachment.
BERRY All Geared Head Centre Lathe, 8in. centres × 108in. b.c., gap bed.
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chine. Capacity 10,000 lbs. Tensile, Compression and Beading.—WILCOX & CO., Barr Street, Birmingham 19. NORthern 1234/5.

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Auto, New and under Maker's Guarantee. —BOX D48, MACHINERY, Clifton House, Euston Road, N.W.1.

Classified Advertisements (PLANT FOR SALE, contd.)

Cashmores

Selections of Machine Tools from Stock or Early Delivery

DRILLING MACHINES

New **KITCHEN WALKER** 6ft. E. 3 Radial Drilling Machine, No. 5 M.T. spindle.
ASQUITH LDR 4ft. 6in. Radial Drilling Machine, No. 4 MT spindle.
KITCHEN & WADE 6ft. Girder Type Radial Drilling Machine, 18 spindle speeds, 6 feeds. No. 5 M.T. spindle, motorised 400/3/50 supply.

BORING MACHINES

WEBSTER & BENNETT Series D 36in. Single Column Type Vertical Boring Mill, motorised 400/3/50 supply.

SLOTTING MACHINES

ORMEROD 12in. stroke Slotting Machine, 27in dia. rotary table, motorised 400/3/50 supply

LATHES

CRAVEN 15in. S.S. & S.C. Lathe, to admit 16ft. between centres.
DEAN, SMITH & GRACE Surfacing and Boring Lathe, with hexagon turret, swing over bed 24in., swing in gap 36in.
LANG 12½in. Gap Bed S.S. & S.C. Lathe, to admit 10ft. 6in. between centres.
CRAVEN 15in. S.S. & S.C. Lathe, to admit 25ft. between centres. Two Saddles.
LANG 15in. Centre Lathe, two saddles, admit 17ft. 6in. between centres, motorised 400/3/50 supply.

MILLING MACHINES

CINCINNATI Model 2MI Universal Milling Machine, with universal dividing head, vertical milling attachment, working surface of table 52½in. × 10in. 1953 machine.
C.V.A. "Kearnley & Trecker" model 2E Dial Type Horizontal Plain Milling Machine working surface of table 41in. × 12in., longitudinal feed 29in., cross feed 12in., 8 spindle speeds 25/1,000 r.p.m., motorised 400/3/50 supply.
CINCINNATI Model 3/36 Hydromatic Milling Machine, table 54in. × 14in., motorised 400/3/50 cycles.

BROACHING MACHINE

CINCINNATI 10 ton Vert. Single Ram Hydraulic Surface Broaching Machine, 66in. stroke, 20in. × 20in. table, motorised 400/3/50 cycles.

GRINDING MACHINES

JONES & SHIPMAN 8in. × 16in. Tool and Cutter Grinding Machine.
CHURCHILL 16in. × 36in. Model PBH Universal Grinding Machine, with hydraulic feed and internal grinding attachment.
JONES & SHIPMAN 10in. × 27in. Horizontal Spindle Hydraulic Surface Grinder.

PLANING MACHINE

STIRK 10ft. × 4ft. 6in. × 4ft. 6in. "Hiloplow" Double Column Planing Machine, with four toolboxes, Stirk Split Field Motor Drive.

POWER PRESS

New **BUTTERLEY** No. 4, 20 Ton Ungeared Power Press, 1in.-3in. adjustable stroke.

SAWING MACHINES

NOBLE & LUND 11/16in. Fluifeed Cold Circular Sawing Machine, with hydraulic vice, capacity up to 5in. diameter rounds.
NOBLE & LUND 24in./28in. Cold Circular Sawing Machine, 10in. dia. rounds, 9in. squares, 18in. × 7in. seams, motorised 400/3/50 cycles.

SCREWING MACHINES

KENDALL & GENT 3-2 Tangential Head Screwing Machine, to screw bolts up to 2in. outside diameter, tubes up to 3in. inside diameter, machine fitted with leadscrew motorised 400/3/50 supply.

MISCELLANEOUS

CLYDE 10 ton Overhead Electric Travelling Crane, 52ft. 3in. span.

All the above machines are motorised 400-440/3/50 cycles.

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BULLARD 16in. Type D 6 Spindle Mult-au-matic Serial No. 22594. Fully rebuilt in 1953 $11,850.00
BULLARD 16in. Type D Mult-au-matic 8 Spindles Serial No. 22625 $25,250.00
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BULLARD 16in. Type D 8 Spindle Mult-au-matic Serial No. 22468 in excellent condition $36,800.00
EXCELLO Hydraulic Single End Precision Boring Machine Model No. 2112A. Serial No. 10909 $4,575.00
EXCELLO Double Ended Precision Boring Machine. Model No. 17A New in 1957 $8,255.00
HEALD Boromatic Single end precision Boring Machine Model No. 421. New in 1953 $7,150.00
HEALD Boromatic Single End Hydraulic Precision Boring Machine Model No. 321. New in 1952/53 $5,550.00
MICHIGAN Model No. 1712 Universal Relieving Lathe suitable for Rotary cutting tools, single and multiple thread hobs, and various other cutters $8,950.00
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BARBER & COLMAN Automatic Hob Sharpener Model No. 3 $2,050.00
BARBER & COLMAN No. 6-10 Gear Hobber Serial No. 3642 $3,925.00
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LEES BRADNER Model 7A Six Spindle Extended Column Rotary Gear and Spline Hobbing Machine. New in 1946-47. $12,350.00
GLEASON No. 27 Hypoid Grinders serial No. 27980. New in 1952 $14,500.00
GOULD & EBERHARDT Universal Gear Hobber, for spur helical, double helical (herringbone) Gears. Model 96H. In as new condition. Capacity diameter 106in. × 54in. $64,000.00
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CLEVELAND Model 225 Rigid Hobber. Eight Station Type Rotary Production $15,475.00
CLEVELAND 8810 Rigid Hobber Eight Station Rotary Universal Gear Hobber $36,000.00
GLEASON Hypoid Rougher Model No. 26 $20,250.00
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NEW RED RING Model GCK 96in. Heavy Duty Gear Shaver for Spur or Helical or Herringbone gears up to 96in. in diameter, by 11in. face by 1 D.P. $74,425.00
CINCINNATI 5-54 Duplex Hydro Broach Twin Ram Vert Hydraulic Surface Broach $6,600.00
NATIONAL 3in. High Duty Forging Machine. New in 1947 Machine designed to make a wide range of forgings from bar stock in sizes up to 3in. dia. $37,800.00
PFAUTER Model R1 (H) Gear Hobbing Machine 15in. Capacity $1,050.00

These excellent machines are lying in our U.S.A. SHOWROOMS.

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Landis 10in. × 24in. Type "C" Universal Grinder. Internal Attachment. New condition.

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Newall 10-U Lapping Machine. Max. throw 17¼in. suitable round or flat workpieces. Current model. £235. Built-in motor, 400/3/50.—BOX D55, MACHINERY, Clifton House, Euston Road, N.W.1.

HERBERT Model OV Swivel Head Vertical Milling Machine. Speeds 250 to 2,000 r.p.m. Table 18in. × 5in. W.S.

PARKES (MACHINE TOOLS) LTD.,
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DIMCO

No. 3 **GISHOLT** Bar Feed Capstan Lathe with equipment.
No. 2 **WARNER & SWASEY** Capstan Lathe. Chucking.
2D **HERBERT** Bar Feed Capstan.
No. 3 **GISHOLT** Chucking Capstan.
43in. × 12in. **FITZ WERNER** Vertical Miller. Swivelling head.
U3 **VICTORIA** Universal Milling Machine with Vertical and Slotting attachments. 8 years old.
20in. **ARCHDALE** Plain Miller. Power feeds and rapids. Spindle speeds 60-1,230 r.p.m.
20in. **ARCHDALE** Plain Miller. Power feeds and rapids. Spindle speeds 30-615 r.p.m.
No. 3 **KITCHEN & WADE** Honer.
No. 2 **KITCHEN & WADE** Honer.
11in./16in. **NOBLE & LUND** Hydraulic Cold saw with Hydraulic clamp.
Model **HBY CHURCHILL** Electrical Grinder.
14in. **BUTLER** Slotter. Power revolving table.
8in. **FABIUS** S.S. & S.C. Lathe. 5ft. between centres. As new.
No. 3 **RICHARDS** Horizontal Borer Model PRT3.
No. 3 **KEARNS** Horizontal Borer.
No. 2 **KEARNS** Horizontal Borer.
8in. **REED PRENTICE** Lathe 6ft. 6in. between centres.
16in. **CRAVEN** Lathe 20ft. between centres.
54in. × 15in. **CRAVEN** Universal Milling Machine.
HERBERT SE. Capstan Lathe.
24in. **ORCUTT** Automatic Gear Grinder (New).
4A **LIBBY** Turret Lathe.
CRAVEN Worm Milling Machine.

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Classified Advertisements (*PLANT FOR SALE, contd.*)

K·E·N·T

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C.V.A. No. 26. 1960 Machine.
C.V.A. No. 12. 1960 Machine.
C.V.A. No. 8. 1950.
B.S.A. ¼in.

LATHES

Broadbent 14in. × 7ft., unused.
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D.S. & G. 18in. × 12ft. S. & S.
Betts Bridgeford 15in. × 18ft.
Lang 6¼in. × 3ft. S.S. & S.C.
Holbrook 6¼in. × 4ft. Gap bed.

MILLING MACHINES

Sant Andrea U.F.O.3 Hor. 57in. × 14in., as new.
Archdale 20in. Hor. Rapid.
Reinecker Vert. 52in. × 24in. with built in cir. table, 30in.
Jason Vert. 48in. × 12in. Sw. and Sl.
Herbert 15s Vert. 48in. × 12in.
Adams No. 5 Thread Mill.

CAPSTANS AND TURRETS

Minganti 1a Turret, 2¼in. Bar.
Gisholt No. 3 Capstan.
Warner & Swasey No. 3 Capstan.
Ward No. 2a Capstan Lathe.
Herbert 1S Capstan Lathe.
Murad 3Q Capstan Lathe.

MISCELLANEOUS

Churchill NB 18in. × 6in. Surface Grinder
B. & S. No. 2 Surface Grinder.
Excel No. 1 Surface Grinder.
C.V.A. 10 Die Press.
Malden Bar-ending Machine.
Raboma 4ft. 6in. Radial Drill.
K. & W. 2in. Pillar Drill.
Granor 26in. H.D. Shaper.
Hutto Vert. Honer.
3 Ton Hi-ton Press.
S. Platt 3in. × 14g. Tube Roller.
Edwards 4ft. × ¼in. Power Guillotine.

Many other machines in stock.

All motorised 440/3/50.

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New Edwards 6ft. by 16G capacity.
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Secondhand. 6ft. by 16G. £155.0.0
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New. 6ft. by ¼in. £840.0.0
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HERBERT Auto Juniors (2).
RYDERMATIC No. 12 Vertical Multi-Tool Lathe.

BROACH

FORST R1A5 Universal Vertical Broach for internal and surface broaching, 5 tons, 39½in. stroke. 1952 machine.

RADIAL DRILL

New VOEST Swivel Head Radial, 1in. capacity, 3ft. 3in. radius.

GRINDERS

BROWN & SHARPE No. 2 Surface.
JUNG AS Internal.
CHURCHILL HBY Internal.
KEIGHLEY Type XL Hydraulic Plain Grindar, 6in. × 18in.
CHURCHILL 10in. × 24in. Universal.
LANDIS 12 × 48 Universal.
BROWN & SHARPE No. 3 Universal.
NORTON 14in. × 36in. Universal.
New BAMKIN Tool and Cutter.

CAPSTAN AND TURRET LATHES

LIECHTI PR Turret Lathe (Swiss).
GISHOLT IL Turret Lathes.
FOSTER No. 2B Turret Lathe.

CENTRE LATHES

SMART & BROWN Type M 4in. Precision.
WARD, HAGGAS & SMITH 8¼in. Gap Bed, 36in. between centres.
CROMWELL 3¼in. Precision.

MILLERS

ARCHDALE 14in. Manufacturing type.
CINCINNATI Type OK 18in. Horiz.
EDGWICK 18in. Horizontal.
ARCHDALE 20in. Twin Overarm Horizontal. Table 40in. × 10in.
KENT-OWENS 1-8 and 1-14 Hydraulic Production.
MILNES Sw. Hd. Vertical. Table 30in. × 8¼in.
HERBERT 23V Vert. Table 68in. × 17in. 48in. traverse.
REED PRENTICE No. 6 Vertical. Table 84in. × 20in.
HOLROYD TI17 Thread Miller.
HELLER Automatic Thread Millers (4).
ASQUITH HKO Duplex Keyseater.

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V & O. No. 11 Double Action. Approx. 10 tons. Roll feed. Max. draw 1in.

All machines motorised 400/3/50 unless otherwise stated.

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PENSOTTI 14in. Swivel Head Slotting Machine. 24in. dia. Rotary Table, Vernier calibrations.

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F. J. Edwards Ltd

GRINDING MACHINES

SMART & BROWN 14in. cap. Internal Grinder.
BRYANT 16-38A Hydraulic Internal Grinder.
CHURCHILL Model HBB automatic sizing traverse feed type internal Grinding Machine with spindles for combined hole and face grinding, max. swing 19in.
PRATT & WHITNEY 36in.×12in. Vertical Spindle Surface Grinder.
JACKMAN No. 28, 53in. Disc Grinder.
HUNT No. 3 Twist Drill Grinder, 3in. cap.
HUNT No. 1 Twist Drill Grinder, ¼in. cap.
BANDFACERS 43in. × 6in., and 36in. × 4in. (New.)

MILLING MACHINES

CINCINNATI 0-8 Vertical Miller, 20in. × 6in.; 150-1,300 r.p.m.
ADCOCK & SHIPLEY No. 2 VP Vertical Production Milling Machine, table 30in. × 10in., capacity 22in. × 8in. × 18in., speed 750-1,500 r.p.m.
REED PRENTICE No. 2 V.G. Vertical Miller; table 20in. × 9in.; capacity 16in. × 11in. × 15in.
ARCHDALE 12in. light type high speed Vertical Milling Machine, table 17in. × 10in., 12in traverse, speed 235-1,500 r.p.m.
B.C.A. Precision Vertical Milling, Boring and Drilling Machine, 8in. dia. table.
HERBERT 46V Vertical Milling Machine; capacity 36in. × 13¼in. × 22¼in. table 58in. × 15in.; power rapid all ways.
CURD NUBE 2-spindle Vertical Profile Miller; table 17¼in. × 14¼in.
MILWAUKEE 2K Universal Miller; table 56in. × 12in.; capacity 28in. × 10in. × 17in.; 15-1,500 r.p.m.
CINCINNATI No. 2 dial type Universal Miller, table 49in. × 12in.; capacity 28in. × 10in. × 18in.; 500 r.p.m.
VICTORIA U.1 Universal Miller, table 40in. × 11in., capacity 25in. × 8in. × 16in., speeds 31 to 1,010.
VICTORIA U.1 Universal Miller, table 40in. × 11in.; capacity 25in. × 8in. × 16in., speeds 31 to 1,010; with vertical milling attachment.
VICTORIA U.2 Universal Milling Machine, table 45in. × 11in. with vertical milling attachment, slotting attachment and rotary table.
PROGRESS Universal Milling Machine, table 40in. × 10in., capacity 24in. × 9in. × 18in.
PEDERSEN Horizontal Miller; table 49in. × 10in.; capacity 24in. × 7¼in. × 16in.
ADCOCK & SHIPLEY 1AD Horizontal Milling Machine; table 19in. × 7in.; capacity 10in.× 6in. × 10in.; speeds 50-2,500 r.p.m.
HERBERT No. 1 Horizontal Milling Machine; table 26in. × 8¼in.; capacity 10in. × 3¼in. × 7in.; speed 100-530 r.p.m.
MILWAUKEE 4K Horizontal Milling Machine table 82in. × 18in., capacity 42in. × 14in. × 20in., power rapid traverses, speeds 13 to 1,300 r.p.m.
HOLROYD 12in. × 54in. Thread Milling Machine; 7in. spindle bore.
HOLROYD Thread Milling Machine, 6in. dia. capacity for internal and external work.
HOLROYD No. 2A Thread Milling Machine; capacity 4in. × 30in.
BECKER Automatic Milling Machine; table 23in. × 12in.; with auto cycle to table and spindle.
KENT-OWENS 1-14 Production Miller; table 32in. × 9in.; hydraulic feed and rapid traverses.
KENT-OWENS 1-8 Hydraulic Production Miller; table 25in. × 9in.; 100-1,335 r.p.m.
EDGWICK No. 2 Plain Miller. Table 46in. × 11in.; capacity 25in. × 7¼in. × 17in. Speed 24 to 405 r.p.m.

PLANING MACHINES

BUTLER 3ft. Openside Planer with side head.
REDMAN 12ft. × 3ft. 6in. × 3ft. Planer, two toolboxes.

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Telephone: EUSTON 5000 *Telex 24264*
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TWO WARD 2A Capstan Lathes. Arranged collet chuck and bar feed.

TWO WARD 3A Capstan Lathes. Both equipped ball chuck and bar feed.

DRUMMOND Model K Capstan Lathe, arranged for chucking. 2 1/16in. Hollow spindle.

ONE HERBERT 2B Capstan Lathe, arranged for chucking.

HERBERT 1S Capstan Lathe, part bar feed.

TWO MOREY 2G Capstan Lathes, arranged for chucking.

WICKMAN 1¼in. 5-Spindle Bar Automatic, well equipped turret tools, collets, bar feed, and tapping attachment.

HERBERT 1¼in. Single Spindle Bar Automatic, with equipment.

DEAN, SMITH & GRACE, A.N. Type, 7in. by 4ft. between centres S.S. & S.C. Gap Bed Lathe. 2in. H.S. Swing in gap 24¼in. by 7¼in.

CARSTENS 4½in. by 20in. between centres S.S. & S.C. High Speed Precision Lathe, fully equipped with collets, chucks, etc.

CHURCHILL-CUB 5in. by 20in. between centres S.S. & S.C. Lathe, with chucks, pick-off gears.

KEARNS No. 2 Horizontal Boring and Facing Machine, with Vernier Height Gauge and Boring Bars.

PEARN-RICHARDS No. 2 Horizontal Boring and Facing Machine. With Vernier Height Gauge and Boring Bars.

KEARNS No. O.A. Production type Horizontal Boring Machine with 2in. dia. traversing spindle.

ARCHDALE 5ft. Radial Drilling Machine, No. 5 M.T. Tee slotted low base, approximately 4ft. by 6ft.

KITCHEN & WADE Heavy Duty Pillar Drill. Spindle bored No. 4 M.T. Rise and fall table 24in. dia., swings round column.

ARCHDALE Two-Spindle Relieving Drill, No. 1 M.T. Power feed and independent motor drive to each spindle. Table W.S. 36in. by 15in.

TWO HAHN & KOLB Two-Spindle Drilling Machines. Power feed and independent motor drive to each spindle, fitted ¾in. drill chuck. Table W.S. 21½in. by 9in.

DISKUS Vertical Spindle Surface Grinder, hydraulic feeds. Table 53in. by 10in. 14in. dia. segmental wheel.

CHURCHILL Model "O" Universal Tool and Cutter Grinder, capacity 8in. by 16in.

EDGWICK No. 1 Keyseating Machine.

DAVID BROWN Worm Shaft Milling Machine, 4in. centres by 33in. between centres.

BROWN & SHARPE No. 2 Universal Milling Machine. Table W.S. 46in. by 10in. Spindle speeds 30-1,300 r.p.m. With high speed Vertical Milling Attachment, Slotting Attachment, Universal Dividing Head, chuck, change gears, rotary table, etc.

CINCINNATI No. O.8 Vertical Milling Machine. Table W.S. 20in. by 6in. Spindle speeds 150-1,300 r.p.m.

THREE HERBERT O.V. Vertical Milling Machines, swivel head. Table W.S. 18in. by 5in. Spindle speeds 250-2,000 r.p.m.

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RIVETT, Model 121.
JUNG, 3in. capacity.
SMART & BROWN 3in. capacity.

ROLLS TOOLS LTD. No. 1 Factory, P rford Road, Pyrford, Woking
Contact Mr. P. W. Gander Telephone: Byfleet 43252/3 & 4145

Classified Advertisements (*PLANT FOR SALE, contd.*)

RING BELLS *for machine tools*

LEEDS 63-7398

BETTS 12in. Production Slotter. Circular table 29½in. Good throat. M.D. 420/3/50.

GRAHAM & NORMANTON 20in. Crank Shaper. V-belt drive from 5 H.P. motor. 9 ram speeds.

HILMOR Type C.1 Tube Bender. Non-Mandrel type. For steel tubes up to 2½in. dia. Hand operated.

PLANERS LTD. Double Housing Planer. Cap. 8ft. 0in. by 2ft. 6in. by 2ft. 6in. approx. 2 toolboxes. M.D. 400/3/50.

TAYLOR & CHALLEN 10-ton Horning Press. Model No. 793. 3in. stroke; 1¼in. adjustment to slide; fixed horn. Electrics 400/3/50.

MILWAUKEE 2K Vertical Miller. Table 56in. by 12in. With power all ways including head. 24 speeds 15-1,500 r.p.m. M.D. 400/3/50.

MONARCH 18in. by 48in. S.S. & S.C. Lathe. Flamard bed. Taper turning. M.D. 400/3/50.

FRITZ WERNER Model 810I Manufacturing Miller. Table 36in. by 12in. Long. traverse 20in. 16 speeds 45-2,240 r.p.m. by change gears with fully automatic cycle. M.D. 415/3/50.

VAN NORMAN Model 2LP Plain Horizontal Miller. Table 45in. by 10in. Long. power traverse 28in. Quick power all ways. 18 speeds 30–1,450 r.p.m. M.D. 420/3/50.

HERBERT No. 9 Combination Turret Lathes.

8½in. **J. MITCHELL** S.S. & S.C. Gap-bed Lathes. Swings 30in. in gap. 4ft. 6in. between centres. 9 speeds 30–600 r.p.m. M.D. 400/3/50.

CARTER & WRIGHT No. 4 Dual Feed Keyseater. T-slotted table 38in. by 12in. Cuts keyways up to 30in. by 1¼in. M.D. 400/3/50.

MASSEY 3-cwt. Slide Type Pneumatic Hammer. Built 1952. 160 blows per minute. Drive by 13 H.P. motor 400/3/50.

JONES & SHIPMAN Fig. 138 Universal Precision Grinder. Cap. 27in. by 10in. Swivelling and elevating wheelhead. With internal spindle, etc. M.D. 400/3/50.

NORTON Type C 10in. by 36in. Plain Cylindrical Grinder. Filmatic bearings. M.D. 400/3/50.

PRECIMAX MPO 5in. by 18in. Plain Grinder. Admits 18in. by 2in. wheel. M.D. 400/3/50.

CHURCHILL H.B.A. Internal Grinder. Swing inside water guard 12in. M.D. 400/3/50.

AVEY 2 spindle Sensitive Drill. No. 2 M.T. M.D. 220-440/3/50.

H. BELL (Machine Tools) LTD., Walter Street, LEEDS 4.

Corona Heavy Duty Vertical Drilling machine. No. 5 Morse Taper Excellent condition.

Further details from:—
C. & G. OLDFIELD, LTD.,
15, Albemarle Street,
PAISLEY.

24in. Alba 6S Shaping Machine with a-c. motor 400/440/3/50. 6 ram speeds 8-72 s.p.m. Table 22in. × 13in., 27in. long. traverse. Overhauled (ready).—LEE & HUNT LTD., Crocus Street, Nottingham. 'Phone 84246.

Barker 18in. 3-jaw Self Centring wrenchless chucks.—HICKS MACHINERY, LTD., 26, Addison Place, London, W.11. Tel.: PARk 2333.

2½in. Heap Powered Screwing Machine. Tangential Diehead All-geared Machine. Range dies, etc. Excellent cond. £385. —BOX D56, MACHINERY, Clifton House, Euston Road, N.W.1.

Alba 24in. Shaper, Type 6S, 400/3/50 electrics, machine vice, inching button, 6 speeds, good cond.—C. L. THOMAS LTD., Stirling Road, Solihull. Tel.: 3075-6.

Cincinnati No. 2 M.H. Plain Horizontal Milling Machine, W.S.O.T., 7in. × 44in.

Further details from —
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

Bullard Verticalauto, D-type, 8 spindle 16/23, double indexing. Complete with compound slides and chucks.—HENRY KIRK (MACHINE TOOLS) LTD., Yate, Bristol. Tel. Chipping Sodbury 3081.

LITTON'S MACHINE TOOL CO., LTD.

LANG 7in. × 6ft. bed Precision S.S. & S.C. Tooling Lathe with Whitworth, Metric and Module Gear Box. Relieving attachment and speed reducer.

GIDDINGS & LEWIS Model 25-RT 2½in. spindle Horizontal Boring Machine.

MATTERSON No. 12 Thread Milling Machine, capacity external 6in., internal 5in. × 27in.

CHURCHILL Model 'OH' Semi Universal Grinding Machine, maximum swing 8¼in. × 16in. between centres.

KEARNS No. 3 Facing Machine. Maximum distance facing head to steady 10ft. 3in., maximum diameter faced 42in. 24 Spindle speeds. 8 feeds. Motorised 400/440 v., 3 phase, 50 cycles.

MATTISON 36in. × 12in. Horizontal Spindle Surface Grinder. Hydraulic feeds up to 100ft. per min. Fitted 36in. × 12in. magnetic chuck, wheel size 20in. Motorised 15 h.p., 400/440 v., 3-phase, 50 cycles.

G.S.P. 5ft. Radial Drilling Machine. 32 spindle speeds. Low base.

SMID SRE 32 Precision Capstan Lathes. Centre height 5¼in., hole through spindle 1¼in., collet capacity 1¼in. Spindle speeds up to 1,800 r.p.m. NEW EX STOCK.

KITCHEN & WADE 4ft. Radial Drill.

LANG 34in. swing Boring and Facing Lathe. Spindle bore 3¼in., chuck to turret 42in. Fitted screw cutting. Motorised 400/440 v., 3-phase, 50 cycles.

PROGRESS Model N.535 10in. centres × 40in. between centres S.S. & S.C. Gap Bed Lathe. Spindle speeds 20-900 r.p.m. Complete with Hydraulic Copying attachment. Motorised 400/440 v., 3-phase, 50 cycles.

AVEY Model 2 three-spindle Pedestal Drill. Spindles 2 Morse Taper. Spindle speeds up to 2,917 r.p.m.

CINCINNATI No. 4 Dial Type Vertical Milling Machine. Table size 78in. × 16in. Rapid traverse. Spindle speeds 18-450 r.p.m.

JONES & SHIPMAN 2 spindle adjustable centres Drilling Machine. Minimum centres 9in., maximum 50in. 2 Morse Taper. Spindle speeds up to 1,468 r.p.m.

GLEASON No. 7 'REVEX' Bevel Gear Roughers, 14in. diameter × 4 d.p. on 2in. face or 3-4 d.p., dependent on face width.

ASQUITH Model LDR 3ft. 6in. Radial Drill.

BARBER COLMAN Type 'A' Heavy Duty Gear Hobber. 12in. diameter gears × 12in. face × 4 d.p.

ACME GRIDLEY Model RPA-6 12in. swing chucking auto. Maximum length of turning 8in., range of spindle speeds 23 to 202 r.p.m. Travel of toolslide 8in., cross slide 2in. to 4in.

MUIR 12in. Slotting Machine, 32in. diameter, self-acting table.

DEAN, SMITH & GRACE 15in. × 7ft. between centres S.S. & S.C. Lathe, swing in the gap 48in.

CHURCHILL 'CRM' Crankshaft Regrinders. Capacity 20in. × 36in., 20in. × 50in. and 20in. × 72in.

SWIFT 9in. × 9ft. S.S. Lathe. 12 spindle speeds 14 to 500 r.p.m. Swing over saddle 10in.

WARNER & SWASEY 3A Turret Lathe. Hole in spindle 4¼in., maximum swing 24in. Maximum length turned 44½in., spindle speeds 12 to 228 r.p.m.

PRAEHOMA 24in. × 8in. Hydraulic Surface Grinder.

KITCHEN & WADE Vertical Cylinder Borer, capacity 2in. × 6in. diameter × 14in. deep. Three micrometer boring heads.

WADKIN Type LZV Spar Miller. Mills spars up to 30ft. long, infinitely variable cutter speeds up to 1,000 r.p.m., power feed traverse from 2in. to 80in. per minute, with fast return, power vertical traverses and feeds.

ASQUITH & HERBERT HUNT Twist Drill Grinders, ¼in. to 3in. capacity.

BLANCHARD 26in. Rotary Surface Grinder. Ratchet feed to head, rapid traverse.

SWIFT 12in. × 12ft. S.S. Lathe, 7ft. between centres.

BARNES Model 2024 Vertical Hydraulic Honer, capacity 16in. bore × 50in. stroke.

GENDRON 14in. × 80in. between centres Universal Grinder.

MACHINE TOOLS FOR IMMEDIATE DELIVERY

Telephone: SHOreditch 4814/5 372-8 OLD STREET, LONDON, E.C.1 *Telegrams: "Galloon, Ave. London."*

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DOUGLAS
OF HIGH WYCOMBE

NEW MACHINES FOR IMMEDIATE DELIVERY

DRILLING MACHINES

PROGRESS 1 and 1S ½in. cap. Bench and Pillar Drills.
PACERA LB.1 and LF.1 Mk. III ½in. cap. Bench and Pillar Drills.
PACERA MF.2/RC ⅝in. cap. Pillar Drill.
PROGRESS 2G and 2GS ⅝in. cap. Bench and Pillar Drills.
PACERA MB.4 ⅝in. cap. Bench Drill.
PACERA MF.5 1in. cap. Pillar Drill.
ARBOGA E.100S 1in. cap. Pillar Drill.
PROGRESS 3A 1¼in. cap. Pillar Drill.
RICHMOND SR.2 4ft. Arm Radial Drill.
PACERA A.10 ¼in. cap. Articulated Radial Drill.
RICHMOND HB.3/12 4ft. 6in. Arm Radial Drill.

LATHES

WILLSON NEWEL 7½in. × 3ft. 8in. bet. centres.

MILLING MACHINES

TAYLOR Fixed Head Vertical Mill.
VARNAMO FU.2 55in. × 13in. Universal Mill.
VICTORIA U.O 36in. × 9in. Universal Mill.
VICTORIA O.2 Omnimil Combined Horiz. and Vert. Mill.
AUERBACH Lever Operated Plain Mill.

MISCELLANEOUS

B.E.N. VR.15 Compressor.
B.E.N. VR.32 Compressor.
B.E.N. VR.41 Compressor.
DENBIGH No. 6 Standard Fly Press.
DENBIGH No. 3 Standard Fly Press.
NORTON No. 8 Deep Throat Fly Press.

SELECTION OF OUR NEW MACHINES FOR EARLY FORWARD DELIVERY

VICTORIA V.3 Vertical Mill. July, 1961
MYFORD MG.12 Cylindrical Grinder. Sept., 1961
BURDETT 70 18in. × 6in. Hydr. Surf. Grinder. Sept., 1961
JAKOBSSEN SJ.12 . 24in. × 10in. Hydraulic Surface Grinder. Aug., 1961
CARDIFF 7½in. × 40in. S.S. & S.C. Lathe. July, 1961
COLCHESTER 8½in. Mascot S.S. & S.C. Lathe. Aug., 1961
KERRY AG.2 5½in. S.S. & S.C. Lathe. Aug., 1961
SMART & BROWN 1024 Toolroom Lathe. Oct., 1961
WILLSON 7½in. Newel Mk.V S.S. & S.C. Lathe. July, 1961
WOODHOUSE & MITCHELL 7in. 70 Junior Lathe. Aug., 1961
DENBIGH D.4 Horizontal Mill. July, 1961
INDUMA VR.3 Vertical Mill. Sept., 1961
MILNES Vertical Mill. Oct., 1961
RICHMOND No. 3 Vertical Mill. Sept., 1961
VICTORIA U.2 Rapidmil Mill. July, 1961
VICTORIA TV.1 Turret Mill. July, 1961

THIS LIST DOES NOT INCLUDE THE MANY SECONDHAND ITEMS THAT WE HAVE IN OUR SHOWROOMS AT THE MOMENT. WHY NOT CALL ON US TO INSPECT OUR RANGE?

A. DOUGLAS CO., LTD.,
CRESSEX INDUSTRIAL ESTATE,
LINCOLN ROAD, HIGH WYCOMBE,
BUCKS. Tel.: 4390 (10 lines)

SOAG

LATE TYPE HEAVY DUTY POWER PRESSES IN STOCK

WILKINS & MITCHELL 200-ton Double Sided Single Crank Cupping and Drawing Press, type CPD.3, all steel double gear drive, capacity 200 tons, length of stroke 16in., adjustment of stroke 3in., size of platen 32in. × 22in., h.p. motor 45.
HASSENCLEVER Knuckle Joint Coining Press. Type KHP 1500/8, capacity 1,500 tons, number of strokes per minute 32; stroke of slide 2½in.; distance between columns 34½in.; working surface of table 34in. × 44in.; h.p. motor 30.
WEINGARTEN Heavy Duty Double Column Upright Rack and Pinion Deep Drawing Press, type ZRSL, with variable control feed, maximum pressure 100 tons, maximum stroke 83in., table area 34½in. by 39½in., with A.C./D.C. Gen Set drive and complete control gear.
CHAMBERSBURG-CECOSTAMP 96in. × 48in. air-operated Impact Press. H section side frames, 20in. cylinder bore. Working on 100 lb. air pressure. Max. distance anvil to ram 48in. Very little used.

SOAG MACHINE TOOLS, LTD.,
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'Phone: RELiance 7201.
'Grams: "Sotoolsag, London, S.E.11."

Reed Prentice No. 5 Vertical Milling Machine. Table 68in. × 16in. 18 Spindle Speeds 17-600 r.p.m. Excellent condition. Further details from:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

NEW MACHINES EX STOCK

LATHES

BINNS & BERRY Lathe, 12½in. × 7ft. 6in. b.c.
BROADBENT Lathe, 8½in. × 10ft. b.c.
CARDIFF 11in. × 6ft. 8in. b.c.

EARLY DELIVERIES

COLCHESTER 6in., 7½in., 8½in.
WOODHOUSE & MITCHELL 7in. × 3ft. b.c.
WOODHOUSE & MITCHELL 8½in.
WILLSON 7½in. × 3ft. b.c.

R. KELLY & SONS LTD.,
LIVERPOOL. ROY. 4463.

FORREST

SNOW OS 72 Surface Grinder with Magnetic Chuck.
LANG 22in. Boring and Facing Lathe.
LANG 7in. Junior × 3ft. 6in.
RHODES 6ft. × ¼in. Guillotine.
REDMAN 10ft. × 4ft. × 3ft. Planer, Lancs. Drive.
RICHARDS No. 1, 2 and 4 Horiz. Borers.
WEBSTER & BENNETT 36in. Vert. Borer.

W. FORREST & CO. LTD.,
SYLVESTER GARDENS,
SHEFFIELD, 1.
Telephone: 23314/5.

FRYE

GRINDERS

CHURCHILL 18in. by 72in. Plain Grinder.
LANDIS 12in. by 48in. Universal Grinder with internal spindle.
COVENTRY Matrix 21 Thread Grinder.
CHURCHILL 20in. by 84 Plain Grinder with throw blocks for crankshaft grinding.
TRIDENT 18in. by 6in. Surface Grinder.
JONES & SHIPMAN 4in. by 10in. Semi Universal Grinder.

CAPSTANS—LATHES—AUTOS

CONOMATIC 6 spindle 1¼in. Automatic.
WARD 2A Capstan. Bar and Chuck Machine.
LANG 10in. by 60in. S.S. & S.C. Straight Bed Centre Lathe.
HILLE 1¼in. Capstan, speeds to 1,200, feeds to turret and cross slide, hob and drag screwcutting.
SMART & BROWN ¾in. Capstan.
GISHOLT 3L Combination Turret Lathe, 4¼in. hollow spindle. 10 h.p. motor.

MILLERS

Two **STEINEL** Model SH4D Horizontal Milling Machines. 30in. by 8in. Table.
ADCOCK & SHIPLEY No. 3 Horizontal Miller, with vertical attachment. 50in. by 12in. Table speeds to 1,400.
DENBIGH C4 Plain Miller, with adapted motor drive.
RICHMOND MV1 Vertical Miller. Table 30in. by 10in. Speeds to 1,000.
ADCOCK & SHIPLEY 2V Vertical Miller. Table 36in. by 10in. Speeds to 1,500.
WICKMAN MOULTON ATM1 Thread Miller. Max. dia. milled 6in.

BORERS & DRILLS—TAPPERS

WEBSTER & BENNETT 36in. Hi-Power Vertical Borer.
ASQUITH 3½in. Floor Borer, spindle speeds 5.6-350. Screw cutting 3-12 t.p.i.
PROGRESS 4E Pillar Drill.
PEARN RICHARDS Horizontal Borer, 28in. dia. facing head, rapid traverses and screwcutting.
HULLER UG3 Radial Arm Tapper.

PLANERS—SHAPERS—SLOTTERS

SUMMERSKILL 6ft. by 2ft. by 2ft. 6in. Planer.

SHEET METAL MACHINERY
150 ton 10ft. Press Brake, with Fraser Mono Radial. 30 h.p. pumping unit.

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GATE

MACHINERY CO., LTD.

176/178, Victoria Road, Acton, LONDON, W.3. ACOrn 8881

GRINDERS

JONES & SHIPMAN 540 Surface Grinder.
ROBOT 6in. × 18in. Surface Grinder.
NEWMAN 10in. × 24in. Universal Grinder.
BROWN & SHARPE No. 2 Surface Grinder.
HORSTMANN Thread Grinder, capacity 5in. dia. × 9in. b.c.
BROWN & SHARPE No. 5 Cylindrical Grinder.
FRITZ WERNER Model 270A Cylindrical Grinders, 3½in. × 7in. b.c.
BROWN & SHARPE No. 13 Universal Grinder.
BRYANT No. 5 Heavy Duty Internal Grinder.
BENTLEY Form Cutter Grinder.

LATHES, CAPSTANS

WARD No. 10 Turret Lathe.
WARD No. 4 Capstan Lathe.
D.S.G. 8½in. × 30in., 11-490 r.p.m.
HOLBROOK 8in. × 36in., 11-400 r.p.m.
COLCHESTER MASTER 6½in. × 36in. Ainjest Screwing Attachment.
LE BLOND "Regal" 7in. × 40in., 25-500 r.p.m.
BOYES & EMMS S.S. & S.C. Lathe. centre height 16in. × 7ft. 6in.
ROLLO 6½in. Centre Lathe.
RIVET 4in. × 18in. b.c. Precision Lathe.

MILLERS

CINCINNATI 8in. × 18in. Tool and Die Miller.
EDGWICK No. 2 Universal, 46in. × 11in. table, 24-405 r.p.m. Vertical Attachment. Dividing Head.
TRIDENT Vertical, table 30in. × 8in. 75-750 r.p.m.
CINCINNATI 1-18 Production Miller.
KENDALL & GENT Vertical Miller, table 69in. × 19in., speeds 20-300, rapid traverses.
SCHIESS DEFRIES Vertical Keyseater.
MAMMUT 10in. × 23in. Table Horizontal Mill, hand lever operated.
FRITZ WERNER 10in. × 34in. Horizontal Mill.
BROWN & SHARPE No. 2 11in. × 49in. Horizontal Mill, speeds 15-376 Feeds 3/10-15 I.P.M.

PRESSES, SHAPERS, PLANERS AND HOBBERS

BUTLER 14in. Production Slotter.
INVICTA 5in. Shaper.
ORMEROD 8in. Toolroom Slotter.
CHURCHILL-REDMAN 32in. Stroke Heavy Duty Shaper. Excellent condition.
ESSEX No. 32 Punch Shaper.
30-ton **RASKIN** Double Sided Double Geared Drawing Press. Area 20in. × 23in. Draw 4¾in.
New **POREBA** Model HDA.80 Planer, capacity 10ft. × 32in. × 30in. table, drive by Heid gearbox.
DOWDING V8 Gear Hobber.

DRILLS

POLLARD 4-spindle Pedestal Drill, 2-2MT, 2-3MT.
POLLARD 3-spindle Pedestal Drill, 3MT, 110-1,455 r.p.m. Power Feed.
POLLARD 13AX Pedestal Drill.
PROGRESS 4E Pillar Drill.
TAUCO ½in. Bench Drill.
BOLEY Multi Drill VB 10in.
CORONA 13in. 2AP Sensitive Pedestal Drill.
CORONA 20in. Pedestal Drill.
15HEF 4 Spindle Drill.

PRESSES

One 50-ton **SEDGWICK** Mechanical Press Brake, 6ft. bending length, two years old.

MISCELLANEOUS

CANNING Double Ended and Centreless Polishing Machines.

TATE

POWER PRESSES

ESSA Type PL 6.000kg. High Speed Precision Double Sided Press (five machines).
RHODES 3-ton Open Fronted Bench Press with flange motor and **UDAL** guards.
LEE & CRABTREE 15-ton Horning Press.
LEE & CRABTREE 20-ton Horning Press.
LEE & CRABTREE 35 Double Action Mechanical Press.
BLISS Model 20B 27 tons Power Press.
H.M.E. Model DCP3 70-ton Double Sided, Double Crank, Single Action Power Press.
New **MULLER** Model AMP 15-ton Power Press.
Three New **MULLER** Model AMP 22-ton Power Presses.
Three New **MULLER** AMP 35-ton Power Presses.
Two New **MULLER** AMP 45-ton Power Presses.
Two New **MULLER** AMP 60-ton Power Presses, Open Fronted.
Two New **MULLER** AMP 80-ton Power Presses.
One New **MULLER** AMP 100-ton Power Press.

SHAPING MACHINES

BERRY 16in. Shaper.
BROOK 18in. Shaping Machine.
KLOPP 22in. Shaping Machine.
TORPEX 22in. Shaping Machine.
ALBA 4S 18in. Shaper.
ALBA 6S 24in. Shaper.

SAWING AND FILING MACHINES

WESPA AS4 Bandsawing and Bandfiling Machine, hydraulic feed (similar Do-all V/16).
QUALTERS & SMITH Model 10B Horizontal Bandsaw.

TATE MACHINE TOOL CO. LTD.
348-354 KENSINGTON HIGH STREET
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Brown & Sharpe Automatics, OG and 2G, third slides, gears, bar feeds, first class condition.—C. L. THOMAS LTD., Stirling Road, Solihull. Tel. 3075-6.

Kearns No. 1 Horizontal Boring and Facing Machine, complete with Rear Stay. A.C. Motor.

Further details from:—
C. & G. OLDFIELD, LTD.
15, Abercorn Street,
PAISLEY.

10in. × 24in. Churchill Model PAH Hydraulic Universal Tool and Cutter Grinding Machine with rise and fall wheelhead. Fully m/d 400/3/50. Variable hydraulic motion 6in.-180in. per minute.—LEE & HUNT, LTD., Crocus Street, Nottingham. Tel.: 84246.

LANG 15in. S.S. and S.C. Gap Bed Lathe, geared head. 60in. between centres.

PARKES (MACHINE TOOLS) LTD.,
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BETTER TRY 600 FIRST !

WILLSON 7¼in. All Geared Head S.S. & S.C. Gap Bed *CENTRE LATHE*. Admits 36in. between centres. 2in. hollow spindle. 9 spindle speeds 26 to 477 r.p.m. With quick change feed box. Motor drive 400/3/50. Price: £400

PRECIMAX Model M.P.L. Plain Cylindrical *GRINDING MACHINE*. 6in. × 48in. between centres. Variable hydraulic feed to table. Variable speed workhead. Motor drive 400/3/50. Price: £600

TAYLOR Type 1513 No. 1 Rotary *CUTTING OFF MACHINE*, with power feed to cutters and air-operated vice. Max. bar capacity for regular work—3in. dia. Max. bar cut 4in. dia. 2 speeds to cutter head 130 and 260 r.p.m. Motor drive 400-440/3/50. Price: £400

HANCOCK SIMPLEX Model S1A *PROFILE CUTTER*, cutting area in one setting 36in. × 24in. Largest circle cut 24in. dia. Longest straight cut 36in. Thickness capacity ¼in. to 15in. Motor drive 200/1/50. Price: £150

KEARNS Model OB Horizontal *BORING AND FACING MACHINE*, mounted on OC type bed unit. 2¾in. dia. traversing spindle. With 14in. dia. facing head. 16 spindle speeds 10 to 400 r.p.m. Main table 36in. × 30in. Auxiliary table 30in. × 30in. Max. distance spindle to main table 24¾in. Max. distance facing head to boring stay 6ft. Motor drive 400/3/50. Price: £1,600

BUTLER *SLOTTING MACHINE*. Max. length of stroke 14in. Max. distance ram to column 32in. 6 ram speeds 15 to 46 strokes per minute. Power feed to all table motions. 39in. dia. rotary table. Motor drive 400/3/50. Price: £675

PALLAS No. 2 Horizontal Spindle *SURFACE GRINDING MACHINE*. Table size 6in. × 18in. Max. longitudinal traverse 20in. Max. cross traverse 6½in. 2 speeds to table 15 and 20ft. per min. With dust extraction unit. Motor drive 400/3/50. Price: £390

SYKES Model V.10A Gear *GENERATING MACHINE*. Stroke ¼in. to 2¼in. 8 cutter speeds 149 to 622 s.p.m. 7 rates of feed. Complete with change gears. Motor drive 400/3/50. Price: £1,275.

LUMSDEN Model 71 L.E.O.D. Bridge Type Vertical Spindle *SURFACE GRINDING MACHINE*. Capacity 60in. × 18in. Hydraulic table traverse. 20in. dia. segmental grinding wheel. With magnetic chuck. Motor drive 400/3/50. Price: £2,750

WADKIN Model LS High Speed Fixed Head *ROUTING MACHINE*. Max. distance spindle to column 24¼in. Table 30in. × 30in. Spindle speeds 18,000 and 24,000 r.p.m. Complete with frequency changer for 400/3/50. Price: £275

GEORGE COHEN SONS & COMPANY LTD

SUNBEAM ROAD, London, N.W.10
Tel.: Elgar 7222/7.

STANNINGLEY, NEAR LEEDS
Tel.: Pudsey 2241.

Classified Advertisements (*PLANT FOR SALE, contd.*)

WIDDOWSONS

CINCINNATI HYDROMATIC 56-72 Hydraulic Plain Horizontal Production Milling Machine, table 103in. × 26in., speeds 24 to 179 r.p.m

CINCINNATI Model 4HP Heavy Duty Vertical Milling Machine. Table 72in. × 19in., speeds 17 to 480 r.p.m.

CINCINNATI Model 3 OM. Single Dial Type High Speed Vertical Milling Machine. Table 62½in. × 15½in., speeds 18 to 1,300 r.p.m.

WARD No. 13 Combination Turret Lathe, covered bed 25in. concentric chuck, 27in. 4-jaw independent chuck. Good turret tooling, taper turning attachment, 35 h.p. motor 400/3/50. Modern Machine, Excellent equipment.

WARD No. 7 Capstan Lathe with covered bed, speeds 37 to 1,000 r.p.m.

SWIFT 12½in. Centres Gap Bed S.S. & S.C. Lathe, 6ft. between centres, 400/3/50.

SWIFT 11in. Centres S.S. & S.C. Lathe. 6ft. between centres, with taper turning attachment.

DENHAM 9in. Centres S.S. & S.C. Lathe, 4ft. 6in. between centres, with taper turning attachment.

NORTON Model "C" 14in. × 36in. Hydraulic Universal Cylindrical Grinding Machine. Excellent Equipment including Internal spindle, etc.

DAVID BROWN Model MT.30 Spur and Spiral Gear Hobbing Machine. Capacity 30in. dia. × 8in. face or 11½in. dia. × 12½in. face, 3 D.P. Full changewheels.

PFAUTER 24in. Universal Gear Hobbing Machine. Plain and Tangential feed hob slide.

PFAUTER Hob Grinding Machine.

JONES & SHIPMAN Heavy Duty Pillar Drill, No. 5 M.T.

WEATHERLY-OILGEAR Model XL-32 Hydraulic Horizontal Broaching Machine, stroke 60in., capacity 14 tons, 15 h.p. motor.

PEARN-RICHARDS PRT2N Horizontal Boring and Facing Machine. 3in. Traversing Spindle, Chain Drive to head, Coolant fittings.

PENSOTTI KTV.1050 Turret Type Single Column Vertical Boring and Turning Mill with Side head, swing 43in. dia., admit 32in. high under cross slide, 20 h.p. motor.

HERBERT

WIDDOWSON

& SONS LTD.

CANAL STREET, NOTTINGHAM

'Phone: 51891

NEW MACHINE TOOLS FROM STOCK

GRANOR OF HALIFAX 28in. stroke Heavy Duty Shaping Machine. 400-440/3/50.

EARLY DELIVERY

MITCHELL OF KEIGHLEY 8½in. Type DM8 Gap Bed Lathe, by 5ft. 3in. B.C. 400-440/3/50. Instant delivery.
MITCHELL OF KEIGHLEY 10½in. Type DM10 Gap Bed Lathe by 5ft. 5in. B.C. 400-440/3/50. Instant delivery.
MITCHELL OF KEIGHLEY 12½in. Type DM12 Gap Bed Lathe by 6ft. 5in. B.C. 400-440/3/50. April delivery.
VICTORIA No. 2 Rapidmil Universal Milling Machine. Table size 48in. × 11½in. 400-440/3/50. Instant delivery.
VICTORIA No. V2 Vertical Milling Machine. Table size 45in. × 11in. 400-440/3/50. Instant delivery.

CENTAUR TOOL WORKS,
EYRE STREET, SPRING HILL,
BIRMINGHAM, 18

Tel.: EDGbaston 1118 & 1119. 'Grams: Capstan, Birmingham

SERVICE EDWARDS VALUE!

BESCO No. 18 size Inclinable Power Press. Pressure exerted approx. 12 tons. Stroke 1½in. Opening through back 8in. Bed 15in. × 9in. Hole in bed 6½in. × 4½in. Weight approx. 9 cwt.
TWO **BLISS** No. 18 size Inclinable Power Presses. Pressure exerted approx. 8 tons. Stroke 2in. Bed 14½in. × 9in. Hole in bed 6½in. diameter. Opening through back 7in. Weight approx. 8 cwt.
TAYLOR & CHALLEN Double Sided, Double Action Cam Action Drawing Press. Punch stroke 8in. Blankholder stroke 4in. Between uprights 20in. Bed 18in. × 15½in. Hole in bed 8in. diameter. Punch 4in. diameter. Hole in punch 1½in. diameter. Weight approx. 45 cwt.
HAMILTON No. 425 Double Sided Power Press. Motorised for 400/3/50 supply. Pressure exerted approx. 100 tons. Stroke 5in. Between uprights 42½in. Bed 42in. × 32in. Hole in bed 33in. × 20½in. Weight approx. 8 tons.
NEW **BESCO** Double Geared Guillotine. Motorised for 400-440/3/50 supply. Capacity 120in. × ¼in. mild steel. Fitted with automatic sheet hold-down and adjustable front, back and side gauges. Weight approx. 110 cwt.
BESCO Double Geared Hand Operated Universal Folding Machine. Capacity 8ft. 2in. × ¼in. Adjustable for sharp and round bends. With adjustable stop for repetition bending and adjustable back gauge. Lift of clamping beam 8in. Adjustment to folding beam 3in. Weight approx. 72 cwt.
BRONX Type 910 Motorised 90-ton Press Brake. All steel construction. Motorised for 400-440/3/50 supply. Capacity mild steel 10ft. × 10 s.w.g. Stroke 3in. Ram adjustment 5in. Equipped with two back gauge stops with micrometer adjustment. Die space, stroke down adjustment up, 12in. Weight approx. 11 tons.

Photographs of the above are available.

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WHERE ELSE IN THE COUNTRY, IN STOCK FOR DELIVERY AT ONCE, WILL YOU FIND:

12 Multi spindle automatics by Acme Gridley, Cone, New Britain, from ⅞in. to 2⅜in. 6 spindle & Wickman 5 spindle.

8 Boremastics single and double end, by Heald and Excello, of course.

5 Wards, 1A, 3A, 7 capstan, 7 combinations up to 1945, and not at silly prices—and 3 Herbert No. 4 Seniors.

10 single spindle autos from ⅜in. to 5in. by Cleveland, Gridley, Footburt, Brown & Ward, Index and Butterworth.

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BENDING MACHINES
KENNEDY 3A Power, 2in. type.
BORERS (Horizontal)
KEARNS No. 2
BROACHING
AMERICAN Model H2, stroke 30in.
CAPSTANS
HERBERT 2S.
MURAD ¾in.
HERBERT 4B.
DRILLS
ARCHDALE 3ft. Radial No. 3 MT.
DENBIGH 24in. B.G.
HERBERT "C" Power Feed.
CORONA No. 21 AR. No. 3 M.T.
JONES & SHIPMAN 816, 7/16in. cap.
CORONA 1AX, No. 1 Morse Taper.
CORONA 15HF, 7/16in. cap.
LELAND GIFFORD 2-sp., No. 2 M.T.
HERBERT Type B. Single Spindle, ¾in.
CORONA 6MX Cluster Type.
HERBERT Type H, ¼in. cap.
CORONA 12AX, 7/16in. cap.
ENGRAVERS
LIENHARD 3 Dimensional (New).
LIENHARD No. 1H.
HUPFIELD Router.
T.T. & H. Type C, C.B. and M.A.
T.T. & H. Multi Etcher.
FILING AND SAWING MACHINES
JONES No. 13 Bandsaw.
WICKSTEAD No. 1 Hacksaw.
RAPIDOR 6in. Hacksaw.
RAPIDOR Filing.
FOLDERS
Sheet Edging, 30in. × 22g.
GEAR CUTTERS
SAFAG Pinion.
MAXICUT 7in. × 2in. × 6 D.P.
PETERMAN No. 1 and 2.
GRINDERS (Surface)
CHURCHILL RBY 24in. ring.
CAPCO No. 2, 14in. × 6in.
CHURCHILL OSB 8in. × 30in.
LUMSDEN Vert. 210 XXM.
SNOW Table, 20in.
ABRASIVE No. 34 Vertical Spindle.
GRINDERS (Internal)
BRYANT 16/38 and 5.

GRINDERS (Cylindrical)
CHURCHILL 6 × 36in. B.Y.
CHURCHILL PBH 12 × 36in. Uni.
NEWALL 6 × 18. Model XL.
PRECIMAX MPB 10 × 48.
GRINDERS (Miscellaneous)
FIRTH BROWN ½-1½in. Drill.
JONES & SHIPMAN, 10in. × 27in. T. & C.
J. & S. Drill, ½in. to 2½in.
STEDALL WUNDERLI Carbide.
ROWLAND 12in. × 2in. Single Wheel.
WICKMAN NIVEN Carbide.
WADKIN Saw Sharpener.
JACKMAN D/E 18in. Disc.
EXCEL Model OS. T. & C.
TURNER 14/20, 20in. × 3½in. wheels C/E.
MATRIX No. 10, 8in.×20in. Plain Thread.
NEWALL 420 Univ. Threads for taps.
HUNT No. 0 and 1 Tap Regrinders.
HUNT No. 0 and 2 Drill.
CHURCHILL Valve.
HONER
DELAPENA 4-speed.
KEYSEATERS
BENTLEY 5in.
ASQUITH H.K.O. Horiz. Duplex.
EDGWICK 4in.
LATHES
SOUTHBEND 13in. S.S. & S.C.
DENHAM 4½in. × 24in. S.S.& S.C.
LE BLOND Production, 11in.
RIVETT S.S. & S.C. 4in. Model 602.
SOUTHBEND 10in. Toolroom.
WILLSON 7½in. S.S. & S.C.
COLCHESTER TRIUMPH 7in. S.S. & S.C.
SWIFT 12SV5 Facing and Boring ,48in.
MONARCH 10EE × 22in. S.S. & S.C.
SMALLPIECE 9SW Multi-tool.
RIVETT 3½in. Plain. Model 715.
WARD, HAGGAS & SMITH 8½in. × 78in.
RYDERMATIC No. 12 Multi Tool.
BERRY 6½in. S.S. & S.C.
MARKING MACHINE
FUNDITOR "Sand Jet."
MISCELLANEOUS MACHINES
LUKE & SPENCER 38in. × 4 HP Polisher.
CANNING 54in. × 2 HP Polisher.
"LINISHER" A4, 36in. × 4in.
Dust Extractors, Various.

MILLERS (Horizontal)
CINCINNATI 08 Production.
CINCINNATI 1/18 Production.
ROSCHER EICHLER. Table 39in. × 12in.
ST. ANDREA Model UFO3. Table 57 × 14.
KENT OWEN 1/8 Production.
HARDINGE Precision. Table 25 × 6½.
WERNER. Table 14 × 5.
JONES 225 Univ. Table 22 × 6.
ARCHDALE 20in. dial & 14in. mfg.
RICHMOND 03. Table 40 × 10.
U.S. Multi Mill. Production.
MILLERS (Vertical)
BROWN & SHARPE No. 2 Light.
C.V.A. 79 Tool and Die.
REED PRENTICE No. 5, 68in. × 16in. table.
MILNE. Table 30in. × 8in.
WADKIN Type LXIA. Table 36in. × 13in.
PRESSES (Power)
BESCO BA 20 Adj. Str.
BLISS No. 18 Adj. Str.
BLISS No. 16 Bar.
LECRA No. 8. 4 tons.
WRIGHT Clicking Press.
PROFILING MACHINE
CURDNUBE 2 Spindle. Model KIV.
RIVETERS
HIGH SPEED Hammer, 7/16 cap.
TURNER RH18 (⅛in.), RH38 (⅜in.), RH34 (¾in.), RH14 and 14/12 (¼in.), RS6 (⅜in.).
SCREWING MACHINE
ATLAS No. 2, 3in.-6in. (Unused).
SHAPERS
INVICTA 10in. and 14in.
NEWEY 14in.
SHEET METAL MACHINES
BESCO 21in. × 1¼in. Rolls.
RHODES 36in. Cramp Folder.
BESCO 48in. Treadle Guillotine.
SLOTTERS
GSP 9¾in.
EDGWICK.
TAPPERS
ESSEX No. 24, ¼in. cap.
ACE Horiz., ¼in. capacity.
J. & S. Electrotap, ¼in.
THREAD MILLERS
JONES F8I, 4ft. between centres.
WICKMAN MOULTON 1B.

W.S. Pitchmaster Model B Thread Roller, complete with 6 sets of Rolls as new. £675 0s. 0d.—Telephone: NORthern 9071.

Automatic Dial Feed. Suitable for Taylor & Challen B3 Press. 20in. dia. dial with 10 stations.—WILCOX & CO., Barr Street, Birmingham 19. NORthern 1234/5.

Wickman 6in. 5-spindle Chucking Automatic, 1951.—Apply: AUTO-PRODUCTIONS LTD., Sunbury 2499.

B.S.A. and Acme Gridley Bar Automatic—⅛in. 6-spindle, 1⅛in. 6-spindle, 2⅛in. 4-spindle, 2½in. 4-spindle. Chuckers—5⅛in. 6-spindle, 6⅛in. 6-spindle.—BOX D61, MACHINERY, Clifton House, Euston Road, N.W.1.

Bennie 10ft. × ⅜in. Motor-driven Plate Bending Roller for sale. Additional support rollers. Swing out end frame for removing completed cylinders. Top roller self supporting. Arranged motor drive 400/3/50. Weight about 6½ tons. Diameter of top roller 11½in.—F. J. EDWARDS LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham 3.

12½in. Centre "Swift" Heavy duty m/d. hollow spindle S.S. & S.C. Lathe with two saddles each with taper turning attachments. 20 h.p. 400/3/50 motor. 18 spindle speeds 1.5-94 r.p.m. Admits 16ft. 6in. between centres.—LEE & HUNT, LTD., Crocus Street, Nottingham. 'Phone 84246.

One Secondhand Scrivener No. 1 Centreless Grinding Machine, maximum capacity 1½in. diameter with Plunge Feed. Hand Operated. Motorised 400-440/3/50.

C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
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---

7 Ton Anderson Grice Elect. Derrick Crane, 120ft. Jib. Single 35 h.p., 440 volts, 3 phase motor. New 1947. Little used. 10 ton Steam Derrick Crane, 120ft. Jib. New 1947. Condition as new.—Particulars and prices upon application to PLANT MANAGER, HUGH LEGGAT, LTD., Barrhead, Glasgow.

Two New Unused B.T.H. Electro Hydraulic Thrusters, type TK.8008. 400-440 volts, 50 cycles, 3 phase supply. Thrust 800 lbs. through an 8in. stroke. £75 0s. 0d. each.—BONEHAM & TURNER LTD., Mansfield, Notts.

Ward 7 Comb. Turret All-geared with quantity turret equip. Power saddle, screw cutting. Good condition. £475.—BOX D59, MACHINERY, Clifton House, Euston Road, N.W.1.

Richards No. 2 PRT Horizontal Boring and Facing Machine complete Live Spindle.

Further details from:—
C. & G. OLDFIELD LTD.,
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HIGH QUALITY USED MACHINE TOOLS

Used **PRECIMAX** Type UPJ12/72 Hydraulic Universal Cylindrical Grinding Machine with variable speed workhead and electrics to suit 400/3/50.
Used **CINCINNATI** No. 2 Tool and Cutter Grinding Machine. 400/3/50.
HERBERT No. 13 Heavy Duty Combination Turret Lathe. Full chucking equipment. 400/3/50.
TOWN 28in. Vertical Spindle Drilling Machine. Compound table. 400/3/50.
K. & W. 33in. Sensitive Radial Drilling Machine. Swing-aside table, swing-aside arm. 400/3/50.
JONES & SHIPMAN 20in. Vertical Drilling Machine. No. 4 Morse Taper. Power feed. 400/3/50.
KEARNS No. 2 Standard Horizontal Boring Machine with facing head and sliding spindle. 400/3/50.
SNOW T20 Table Surface Grinding Machine.
ARCHDALE 28in. Horizontal Manufacturing Milling Machine, with power and rapid feeds. Table size 49in. × 30in. 400/3/50.
WE UNDERTAKE REBUILDING OF ALL TYPES OF MACHINE TOOLS

CENTAUR TOOL WORKS,
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HERBERT 1¼in. Pedestal Drill.
CORONA 4ft. Radial Drill. £325.

GRINDERS

JONES & SHIPMAN 10in. × 27in. Universal Grinder.
HERBERT HUNT Tap and Reamer. £65.
SCRIVENER No. 1 Centreless, with auto feed.
SMART & BROWN Internal Grinder. 1¼in. Max.
NORTON 18in. × 7in. Hyd. Cyl. Grinder. £395.

LATHES

SOUTHBEND 6½in. Lathe T/T.
JOHNSTEAD 5ft. 6in. Facing Lathe.
MURAD ¾in. 3Q Capstan, full equip.
DARLING & SELLERS 10½in. × 12ft. T/T.
HASSE & WREDE 10in. × 42in.
OLDFIELD & SCHOFIELD 15in. × 60in. £650.
HERBERT SMALLPEICE, 6in. × 24in. Multi-tool.
RIVET Instrument Lathe, 4½in. × 24in.

MILLERS (Vert. and Horiz.)

A KERSHAW Vert. Mill 18in. × 7in.
RICHMOND 0.1 Horizontal 30in. × 8in.
CENTEC No. 3R Auto-cycle, pro mill.
HEY Duplex Spline Mill. £175.
ADCOCK & SHIPLEY IVM Vert. 25in. × 7in. As new.

POWER PRESSES AND SHEET METAL MACHINES

BLISS 250 ton Coining Press.
BLISS 21B 60 ton geared. Adj. Str.
BLISS 20B 20 ton Roll feed. Adj. Str.
RHODES 30 ton geared, adj. str.
BESCO 20 ton.
WARD 20 ton.
TAYLOR & CHALLEN 10 ton.
SEDGWICK 12ft. × ⅛in. Folder.
BESCO 10 ton Power Press. £175.
E.M.G. 9-ton Airdraulic. £200.

MISCELLANEOUS

BOTNIA 5ft. × 18in. Planer.
RAPIDOR 8in. × 8in. heavy duty power saw.
MANURHIN TR12-16 ½in. Auto. 1958.
T.T. & H. Engraver CB with div. table.
MIDSAW 36in. Bandsaw.
BARBER & COLMAN 15in. Hobber.
THIEL Filing and Sawing Machine. £95.
HURTH Key Seating Machine. £225.
THIEL Punch Shaper.
ORMEROD 12in. Shaper with Cam Cutting Attach.
RAPIDOR 15in. × 15in. Filing and Sawing. £165.

Other machines in stock.

WE BUY | **WE SELL**
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Double Cased Gas Heated Drying Oven for sale. Provision internally for four shelves, three 9in. apart, and top shelf 12in. above third. Inside size 35½in. × 35½in. × 84in. high. Thickness of casing 2½in.—Photograph, etc., from F. J. EDWARDS LIMITED, 359 Euston Road, London, N.W.1.

Churchill Model AC, Hydraulic Internal Grinding Machine. Max. swing 24in. Max. traverse of wheelhead 29in. Admits work 60in. Post-war machine.—LEE & HUNT LTD., Crocus Street, Nottingham. 'Phone: 84246.

Kitchen & Wade H.5 Horizontal Boring and Drilling Machine, complete with Square Box Table and Auxiliary Revolving Table. Machine equal to new.

Further details from:—
C. & G. OLDFIELD, LTD.,
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MACHINES NOW IN STOCK

TATE

BORING MACHINES

RICHARDS 72in. Double Column Vertical Boring and Turning Mill.
PADDON MK3 type WP Cylinder Re-boring Machines.

CAPSTANS AND TURRET LATHES

BOLEY-LEINEN Model ER15 ¾in. Capstan (modern).
HERBERT No. 2 Pre-optive Bar Turret Lathe, Flamard bed, 2in. capacity with bar feed, full turret tooling.
HERBERT Model 22A Turret Lathe. 8½in. S.P. Hole.
LIBBY 2H 8in. spindle Turret Lathe.
MURAD Model 3Q ¾in. Capstan Lathe.

DRILLING MACHINES

PACERA ½in. Bench Drill (New).
Two **ARCHDALE** 36in. Radial Drilling Machines. No. 4 M.T.
Two **CORONA** Model 31A Heavy Duty Pillar Drills.
CRAFTSMAN ½in. Bench Drills; four at £25 each.
Various **ACIERA** Precision Bench Drills.

GRINDING MACHINES

LAMBERT Model 73 Watchmaker's Cutter Grinder (two)
CRAVEN Heavy Duty Roll Grinding Machine with capacity for rolls 42in. dia. by 12ft. between centres and fitted with automatic cambering. Will take rolls up to 25 tons weight. Fully motorised machine of modern design. WEIGHT 25 tons.
Two **CINCINNATI** No. 2 Tool and Cutter Grinding Machines.
COVEL No. 2 Tool and Cutter Grinding Machine.
MATRIX No. 16G Plain Straight Thread Grinder.
MATRIX No. 6 Internal Thread Grinders, 3in. by 10in.
HEALD Model 81 Sizematic Internal Grinder.
WOLTERS Model 1.L.1 Hydraulic Internal Lapping Machine.
PETEWE Model 3D Profile Grinding Machine. (Nearly new.)
WALDRICH SIEGEN Roll Grinder. 36in. by 13ft. B.C.
IMPERIA Tool and Cutter Grinder.
KAESER Hydraulic Universal Grinder, 10in. by 30in.
WICKMAN Optical Profile Grinder with projection screens.

CENTRE LATHES

CROWTHORNE 10½in. Lathe.
SOUTHBEND 7in. Centre Lathe.

DIESINKING MACHINES

NASSOVIA Model V.11 Hydraulic Diesinker. Mould capacity 27½in. by 19½in. by 23in. height. (Unused.)
VICTORIA Duplomatic Hydraulic Copy Milling Machine, 8in. by 8in. (NEW).

MILLING MACHINES

VICTORIA Duplomatic Hydraulic Diesinking Machine (almost new).
FRITZ WERNER No. 3230 Precision Vertical Milling Machine, 24in. by 8in. table, longitudinal and cross power feed to table.
EDGWICK No. 1 Horizontal Milling Machine, 40in. by 10in. table.
Four **DENBIGH** Model No. C4 Horizontal Milling Machines.
VICTORIA Junior Mill (new).
SANT ANDREA Model U.F.O/5 Extra heavy duty Horizontal Miller, 86½in. by 19in. Table travel 67in.
VICTORIA Model UI Universal Milling Machine of latest type, in excellent condition.
VICTORIA Junior Omnimil (New).
Two **ARCHDALE** 18in. Automatic Cycle Kneeless Production Millers.
MILWAUKEE Model 2CE Horizontal Miller (dial type) (nearly new).
ASQUITH Model 28V Vertical Milling Machine, table 50in. by 15in.
CUNLIFFE & CROOM No. 2 Vertical Mill (dial).
ARCHDALE 34in. Plain Horizontal Miller (nearly new).

PLANING MACHINES

STIRK 16ft. by 5ft. by 5ft. double column Planers, four toolboxes; modern machines with Lancashire drive (Two).
HOLROYD 17ft. 3in. by 9ft. 6in. between columns Plano Miller.

GUILLOTINES

BESCO 42in. by 10 s.w.g. Power Guillotine.
HANDS 4ft. by ¼in. Guillotine.
RHODES 6ft. by ¼in. Guillotine.

WATCHMAKERS' MACHINES

MIKRON No. 79 Gear Hobber (almost new).
Two **SAFAG** Model 24 Cutter Relieving Machines.

. . . a few yards from Olympia and Earls Court

348-354 KENSINGTON HIGH STREET - LONDON - W.14
WEStern 7031 (5 lines)

Classified Advertisements (*PLANT FOR SALE, contd.*)

Fisher Humphries No. 6 Size
30ft. Double Draw Bench for sale. With two chains for performing four drawing operations simultaneously. With extension back benches 24ft. long for back drawing. Arranged motor drive 20 h.p. 400 volts, 3 phase, 50 cycles. Chain links 5in. long × 1in. wide × ⅛in. thick. Diameter of pins ⅝in. 4in. pitch. Weight about 14 tons.—F. J. EDWARDS LIMITED, 359 Euston Road, London, N.W.1, or 41, Water Street, Birmingham 3.

HELIOT

35 GREENWICH CHURCH ST. LONDON. S.E.10 GRE.1222

CAPSTAN LATHES

WARD No. 7 Chucking, covered bed.

TURRET LATHES

WARD No. 16, covered bed, 8¼in. spindle, 32in. 4-jaw chuck, rapid and power feeds to saddle, cross slide and turret, power rotating turret, spindle speeds 7-225 r.p.m., 50 h.p. motor.

WARD No. 8, covered bed.

WARD No. 10B, covered bed. 4¼in. spindle power rotating turret, power and rapid feeds to turret only, collet head and bar feed.

DRILLING MACHINES

ASQUITH O.D.1 5ft. Radial, with loose box table.

AVEY 2-spindle drill, pedestal base, ¼in. capacity.

HORIZONTAL MILLERS

SUNSTRAND No. 2 Electro Mill, auto. cycle, 12in. by 54in. table.

HERBERT No. 3ND. Plain.

EDGWICK No. 2, 11in. by 42in. table, No. 40 steep taper.

JONES & SHIPMAN duplex slot miller. Hydraulic feed.

VERTICAL MILLERS

WADKIN high speed for light alloy, 16in. by 40in. table.

GRINDING MACHINES

B.S.A.-Landis, 6in. by 18in. plain hydraulic cylindrical grinder.

BROWN & SHARPE No. 2 Surface Grinder, 18in. by 6in.

TAPPING MACHINES

HERBERT No. 2 Flash Tapper, ¼in. capacity.

All machines motorised 400/3/50 unless otherwise stated.

Brown & Sharpe No. 5 Cylindrical grinder, 4in. × 18in. Inbuilt 400/3/50 electrics, power feeds, swivel table. Good cond.; also Jones & Shipman plain grinder, 4in. × 10in. Hand feeds. Good cond.—C. L. THOMAS LTD., Stirling Road, Solihull. Tel.: 3075-6.

Newman

AUTOMATICS

BULLARD Multi-Au-Matic 7in. 8 spindle.
BULLARD Multi-Au-Matic 12in. 6 spindle.

BORING MACHINES

UNION Model BFT 100 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle (1955).
KEARNS No. 3 Horizontal Boring and Facing Machine, 3¼in. diameter travelling spindle.
KEARNS Model OC Horizontal Boring Machine, 3in. dia. travelling spindle.
KEARNS No. 4 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle.
WEBSTER & BENNETT Vertical Boring Machine, table 50in. diameter.
RICHARDS Type PRT Horizontal Floor Boring Machine, 3¼in. travelling spindle, 28in. diameter facing head.
GIDDINGS & LEWIS No. 45 Horizontal Boring Machine, 5in. diameter travelling spindle.

CAPSTAN AND CENTRE LATHES

CHURCHILL-REDMAN Model 13NM Heavy-Duty S.S. & S.C. Gap Bed Centre Lathe, 13in. centre height × 72in. between centres. Swing in gap 50 in.
MITCHELL Model DM10 S.S. & S.C. Gap Bed Centre Lathe, 10¼in. centre height × 7ft. 5in. between centres. (NEW).
OLDFIELD & SCHOFIELD Surfacing and Boring Lathe, 10¼in. centre height.
WARD 7B Combination Turret Lathe.
NILES Heavy Duty Centre Lathe, S.S. & S.C. 17in. centre height × 28ft. between centres.
U.L.R.O. Heavy Duty Centre Lathe, 16in. centre height × 30ft. between centres.

DRILLING MACHINES

HETTNER Radial Drilling Machine, 10ft. elevating arm.

GEAR MACHINES

ORCUTT Model HM24 Hydraulic Internal Gear Grinder.
GLEASON 3in. Straight Bevel Gear Generator.

GRINDING MACHINES

CHURCHILL Plain Cylindrical Grinding Machine, 26in. swing × 84in. between centres (1951).
LANDIS Type C Plain Hydraulic Cylindrical Grinding Machine, 6in. swing × 18in. between centres.
ORCUTT Model HM24 Internal Spur Gear Grinding Machines.
CHURCHILL Plain Hydraulic Cylindrical Grinding Machine, 20in. swing × 72in between centres.
BROWN & SHARPE Plain Cylindrical Grinding Machine, 10in. swing × 36in. between centres.

MILLING MACHINES

CINCINNATI No. 3 High Speed D[illegible] Type Vertical Milling Machine (1950).
CINCINNATI Model 5/72 Plain Hydromatic Milling Machine, table 91in. × 22in. (1952)
CINCINNATI No. 2L Plain Horizontal Milling Machine, table 52in. × 10in.
CINCINNATI No. 1M Vertical Milling Machine.
CINCINNATI No. 4 Dial Type Horizontal Milling Machine.
PRATT & WHITNEY Model BL3620 3-spindle "Keller" Die Sinking Machine.
CENTEC Model 3R Automatic Production Milling Machine, table 25in. × 16in.

MISCELLANEOUS

LANGE & GAILEN 28in. stroke Double Headed Hydraulic Shaping Machine.
TAYLOR & CHALLEN Double Sided 50-ton Geared Power Press, 10in. stroke.

NEWMAN INDUSTRIES LIMITED

Machine Tool Division : YATE, BRISTOL

Tel.: Chipping Sodbury 3311. Telex. 44121.
Cables: "Dynamo Yate."

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Classified Advertisements (*SITUATIONS VACANT, contd.*)

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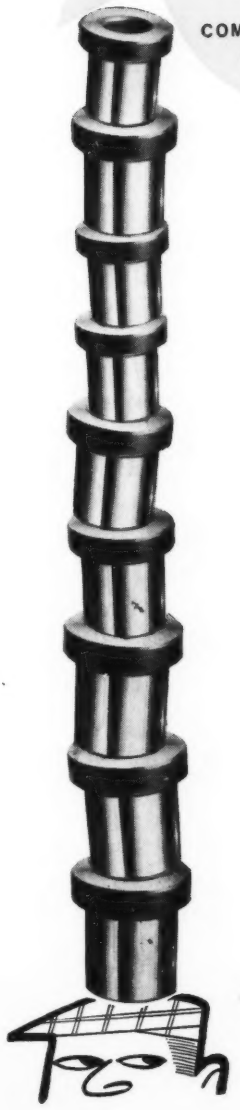

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